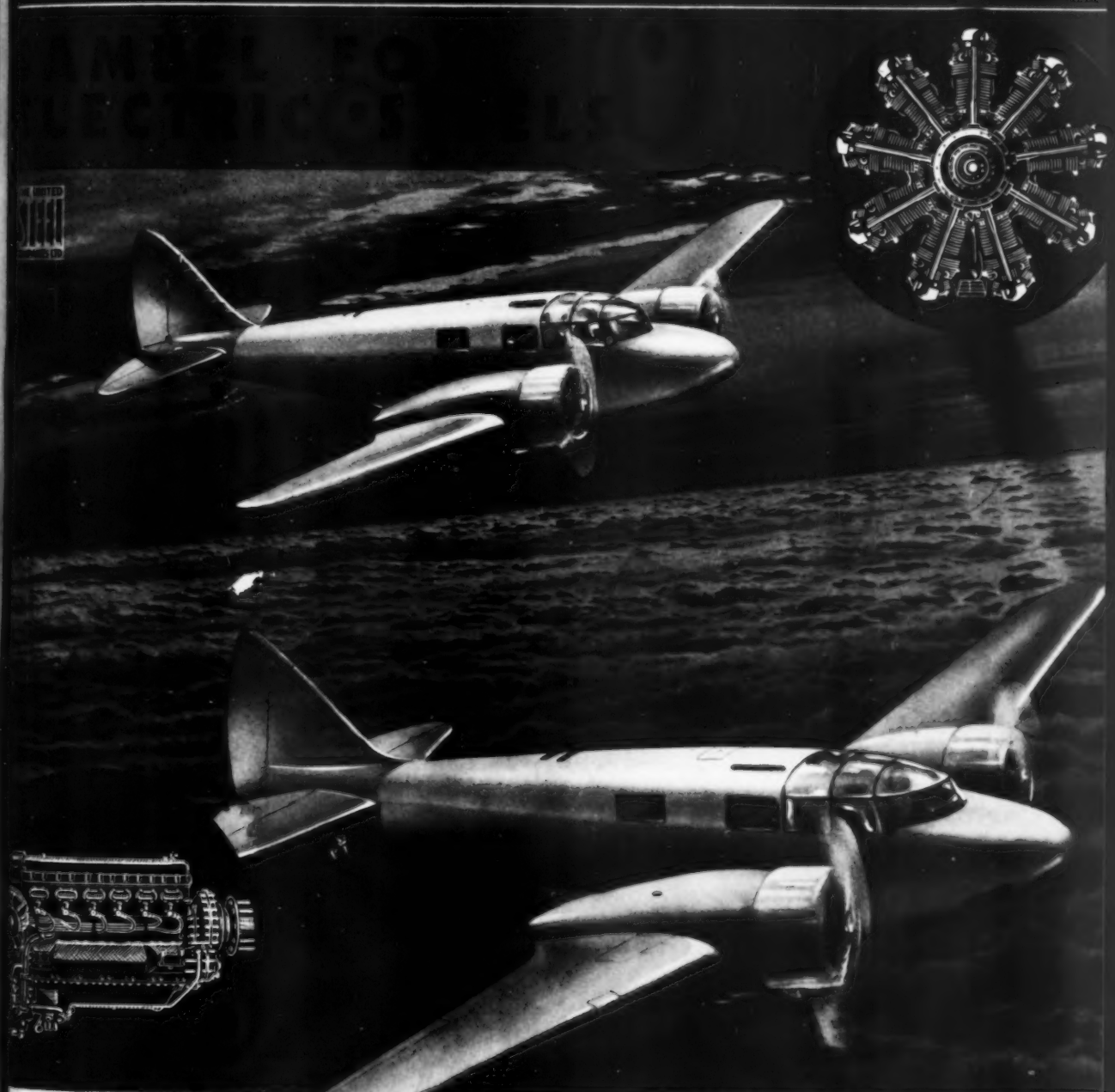
FLIGHT



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The Outlook

Now is the Time

IN the midst of all this real and imaginary international discontent and the tremendous efforts which are being made in this country to rearm rapidly and efficiently, there has been a tendency to push civil flying and airline operation in general into a back seat. Those with no very great degree of foresight are wondering why any manufacturer should trouble about airline operation and the building of civil machines—and may, perhaps, feel somewhat the same about an issue of *Flight* devoted to commercial flying.

Quite apart from the fact that the rearmament business will not (unless the human animal is as insane as he sometimes appears to be) go on for ever and that the manufacturers who are now busy with military aircraft must inevitably consider the future when the civil possibilities will exceed the military, there is one very good reason why air transport is, to-day, more important than ever.

In time of war, not only may the air routes provide the only possible means of communication, but efficient long-range, large-capacity types will be essential for operation over those few remaining routes which still remain open. For instance, circumstances may be visualised in which our normal Empire services to South Africa and Australia can no longer be run over their present routes—or at least with the present stopping points. It will be necessary then to make serious use of the Atlantic and Pacific routes or, at the very best, fly long stages non-stop on the various essential services.

Australia may have to be reached via the Pacific, and South Africa via a new West Coast route. Even now the Canadian Government, in collaboration with the various operating companies, is apparently considering ways and means by which services can be run to Russia, the West Indies and Australia via the Bering Strait and Siberia.

Something to Sell

BE that as it may, it is still necessary to produce good and efficient commercial aeroplanes. The machines designed for military purposes can never be good transport aeroplanes except, perhaps, for the carriage of mails only, and the particular requirements of civil operators mean that the average transport aeroplane can rarely be made into a good military machine.

In spite of the exigencies of rearmament, this country at present has more useful civil machines to sell to the world than ever before. Many of these are or have been designed for our own particular operational requirements, but it is reasonable to suppose that the demands of certain other national air transport companies may be very similar to our own.

Until comparatively recently the civil machines produced in this country could be divided into two fairly clearly defined categories. In the first place were those designed expressly for Imperial Airways, and, in the second, those for unsubsidised operation. Unfortunately, few, if any, other national companies have the same needs as have Imperial Airways, and the result was that excellent types such as the Short "C" class boat, and more recently, the A.W. Ensign and the new "G" class Short boat, which is now under construction, could not reasonably be considered as being particularly suitable for world markets.

On the other hand, the necessity for designing machines for use on our own subsidised internal airline services produced first the D.H. Dragon and then the D.H. Rapide, of which, probably, more have been sold than of any other civil type in the world. The Rapide and, for those who want a somewhat faster type, the Percival Q6, can be considered as being unique among the transport types; each can, in theory at least, be used to operate a self-supporting service without any form of financial assistance.

THE OUTLOOK (CONTINUED)

Present Demands

CHANGING ideas in the matter of Government subsidies have now somewhat modified the position, and this country is producing a medium-capacity, all-metal machine which is suitable for subsidised operation throughout the world, while very much larger, though more specialised, landplane types are also in course of construction. The D.H.95, or Flamingo, has as good or better a sales chance as any American or German type of similar capacity, and because time is an all-important factor the development and test work on the machine has necessarily gone through with considerable rapidity.

Not unnaturally, during the past few years we have tended to take it for granted that America had a hold on the entire market in the high-speed transport class, and it may be a surprise to the operator abroad to find that the Flamingo's performance exceeds those of its American counterparts in almost every particular. Later on, the Fairey F.C.1 and the Short landplane should find a place in the different national airline fleets. We certainly need to attack the civil market as energetically as possible if the future is to be provided for.

There is still a good deal of argument about the best and safest engine arrangement. It is a somewhat expensive, though not necessarily an operationally uneconomic, matter to provide two engines with a sufficient reserve of power to enable the machine to fly and climb on one of them. And the four-engined layout should be reserved for large types. In fact, with smaller types it may eventually be necessary to return to the three-engined arrangement—and, after all, the Junkers and Savoia Marchetti firms have done extremely well with three-engined machines. Three medium-powered and comparatively inexpensive engines will offer the same, or a better, one-engine-failure safety factor than two engines which are being used, in ordinary cruising, at only sixty per cent. of their maximum output.

By way of a postscript it might be added that this country probably has the most complete range of, as well as the most powerful and reliable, engines in the world. On reliability and long inter-maintenance life of engines depends much of the economic success of an airline, and on sheer maximum power depends the ability or otherwise to produce really large long-distance types.

Atlantic Difficulties

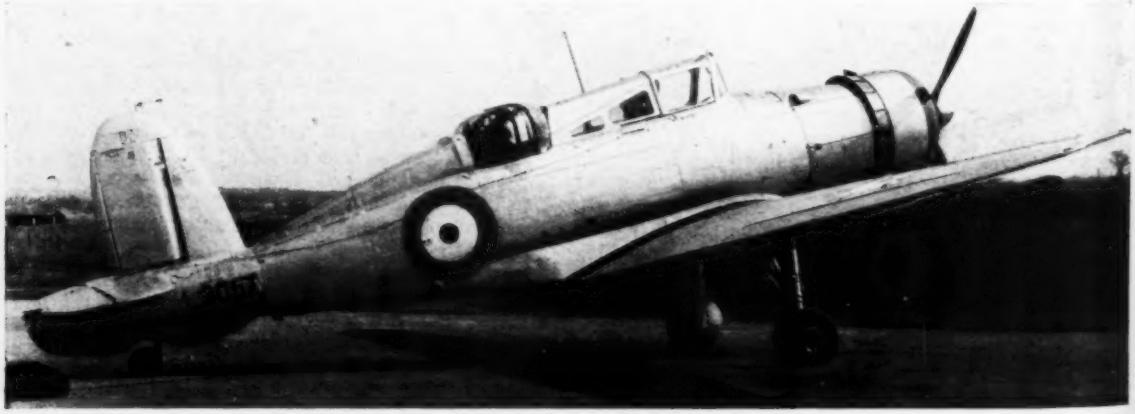
FOR some time it has been known that the operational staff of Imperial Airways and the Directorate of Civil Aviation have held somewhat different views about the matter of Atlantic flying methods, and Imperials have previously been carrying out experimental work to Air Ministry orders.

Now, it seems that the Air Ministry is tending to decide in favour of the refuelling scheme, to the exclusion of all other systems, whereas Imperial Airways still, and rightly, think that every means of long-range payload carrying shall be tried out before making any decision.

The Mayo Composite, for instance, has done good work, but nobody imagines that the prototype arrangement is perfect or even entirely practical, and before the idea can be dismissed with any degree of fairness it will be necessary to carry on with another layout incorporating the results of all the lessons which have been learned with the *Mercury-Maia* combination.

As far as refuelling is concerned, this is by no means the simple or reliable affair that it is sometimes considered to be. A number of operational difficulties have still to be overcome, and not until a series of scheduled flights across the Atlantic are attempted can it possibly be discovered whether the scheme may be used for any but special long-range flights. Even with the most ingenious adaptations, any machine-to-machine transfer of fuel must be a difficult process, demanding considerable skill on the part of the crews concerned, and it may be that the operational problems will be too considerable for this year's Atlantic services to be run to schedule.

The whole affair brings us back to the old question of the use of special machines for special purposes. At the moment, even on the Empire services, the Short boats are being flown with so much mail that only two or three passengers can be carried on each machine. Surely the time has come to use special machines and methods for the carriage of mail. *Flight* has always claimed that this is the only logical arrangement, and when it comes to really long-distance non-stop payload-carrying flights over the Atlantic—made possible only with the help of semi-experimental assistance—the separation of passengers and mail becomes essential Until assisted take-off or refuelling schemes have reached finality it would be rash to make passengers a subject for experiment.



NOT-SO-MYTHICAL. According to the encyclopædia, the roc was a fabulous bird of the East, so huge that it bore off elephants to feed its young. The Blackburn Roc, of which details are now released, is neither fabulous nor gigantic, but it is obviously a very efficient two-seater fighter for the Fleet Air Arm. It closely follows the lines of the Skua, and the engine is a Bristol Perseus. Either a retractable wheel undercarriage or a float undercarriage may be fitted.

BRITISH COMMERCIAL AIRCRAFT

A Guide to Performance and Passenger Accommodation

Operating the world's fastest scheduled service—the D.H. Albatross, which cruises at 210 m.p.h., at Croydon.

AIRSPEED

ALTHOUGH concentrating at present on the manufacture of Oxford trainers for the Royal Air Force, the Airspeed Company were, until comparatively recently, exclusively concerned with the development of civil machines. Following the single-engine Courier, which was the first machine in this country to be fitted with a retractable undercarriage, the company proceeded with the Envoy, a twin-engined cantilever low-wing monoplane of wood construction, and this can be considered to have been virtually the basis of the very successful Oxford. The six-passenger Envoy III, with two Siddeley Cheetah IX engines, has a maximum speed of 203 m.p.h. and a cruising speed, at 62½ per cent. power, of 170 m.p.h.

Makers: Airspeed (1934), Ltd., The Airport, Portsmouth, Hants.

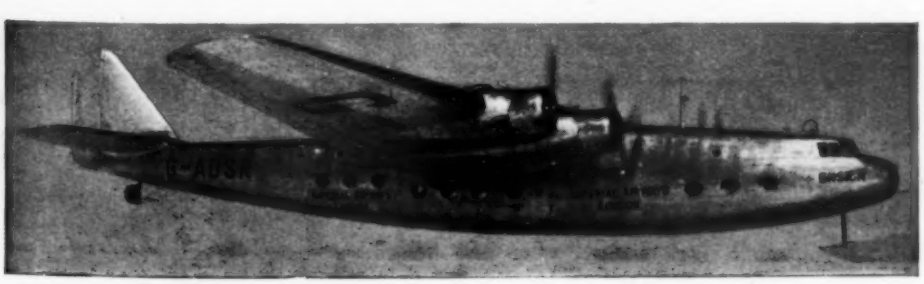
This review offers, in compact form, many useful facts and figures for the airline operator

ARMSTRONG-WHITWORTH

DESIGNED to the specification of Imperial Airways, the A.W. Ensign is a specialised type of very large capacity transport aeroplane. It is an all-metal four-engined high-wing monoplane intended to carry forty passengers for European operations, or twenty-seven passengers by day and twenty by night on the overland Empire services. The wing is of the single-spar type and the fuselage is a monocoque structure. The performance figures below are for the Ensign with re-rated Siddeley Tiger IXs and constant-speed airscrews.

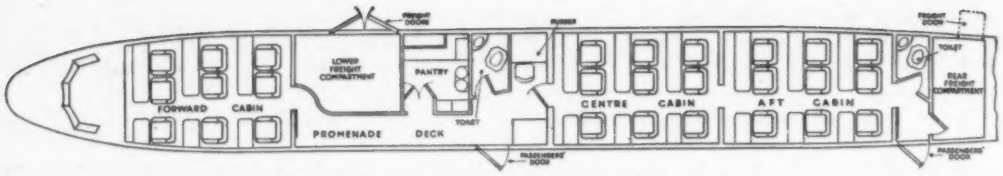
Span	123ft. (37.5 m.)
Length	110ft. (33.5 m.)
Height...	23ft. (7.015 m.)
Wing area (with fuselage)...	2,443 sq. ft. (227 sq. m.)
Weight empty ...	33,000 lb. (14,900 kg.)
Disposable load ...	15,500 lb. (7,300 kg.)
Payload	9,500 lb. (4,300 kg.)
All-up weight ...	48,500 lb. (22,000 kg.)
Wing loading ...	20 lb./sq. ft. (97.6 kg./sq. m.)
Power loading (take-off)	13.5 lb./h.p. (6.1 kg./h.p.)
Span loading	3.2 lb./sq. ft. (156.2 kg. sq. m.)
Max. speed (sea level)	182 m.p.h. (292 km./hr.)
Max. speed (7,000ft.)...	205 m.p.h. (328 km./hr.)
Cruising (2/3rds power, 7,000ft.)	170 m.p.h. (272 km./hr.)
Stalling speed... ...	66 m.p.h. (103 km./hr.)
Initial climb	900ft./min. (275 m./min.)
Climb at 10,000ft. ...	500ft./min. (152 m./min.)
Ceiling...	22,000ft. (6,700 m.)
Ceiling (on three eng.)	15,000ft. (4,570 m.)
Duration (cruising) ...	5½ hr.
Range (cruising) ...	850 miles (1,360 km.)

Makers: Sir W. G. Armstrong-Whitworth Aircraft, Ltd., Whitley, Coventry.



The Armstrong-Whitworth Ensign is the largest commercial machine to go into production. A seating plan appears overleaf.

"Flight" photograph.

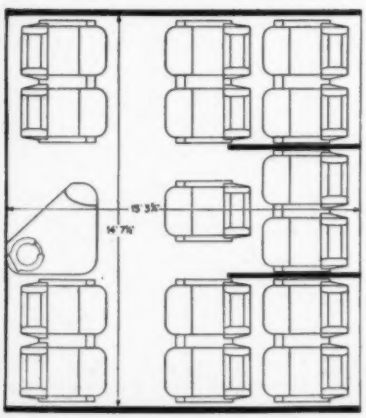


The Ensign cabin in standard medium-range form.

AVRO

ANOTHER firm now forced to leave the manufacture of civil aeroplanes and to concentrate entirely on military types is A. V. Roe and Co. Their Anson coastal reconnaissance machine is a direct development of the 652, two of which were ordered by Imperial Airways several years ago. These particular machines are now in use at A.S.T. for general instruction. In its latest form the 652 is rather similar to the Anson and, with two Cheetah IXs and fixed-pitch airscrews, it has a maximum speed at 7,000ft. of 195 m.p.h. and a cruising speed at the same height of 160 m.p.h.

Makers: A. V. Roe and Co., Ltd., Newton Heath, Manchester, 10.



Roominess is the main feature of the Cunliffe-Owen cabin.

CUNLIFFE-OWEN

THE idea of designing a machine so that the passenger compartment becomes an effective lifting surface would seem to have considerable advantages where really large sizes of machine are under consideration. By way of a start Cunliffe-Owen Aircraft have built an all-metal medium-capacity type with two Bristol Perseus XIC sleeve-valve engines. In this the "Flying Wing" scheme has been carried as far as possible, though only the upper part of the fuselage fairs into the wing and the tail is carried on two boom members. It is arranged to carry twenty passengers in a roomy cabin.

Span	... 73ft. 6in. (22.4 m.)
Length	... 44ft. (13.4 m.)
Wing area	... 826.5 sq. ft. (76.7 sq. m.)
Weight empty ...	... 9,500 lb. (4,300 kg.)
Disposable load ...	... 9,500 lb. (4,300 kg.)
Max. speed (sea level)	... 225 m.p.h. (360 km./hr.)
Max. speed (6,000ft.)	... 235 m.p.h. (377 km./hr.)
Stalling speed ...	... 67 m.p.h. (107 km./hr.)
Service ceiling ...	... 20,000ft. (6,090 m.)
Maximum range ...	... 1,950 miles (3,130 km.)

Makers: Cunliffe-Owen Aircraft Co., Ltd., Southampton Airport, Southampton.

Seen here on its first test outing, the Cunliffe-Owen is now flying again on a second series of tests.

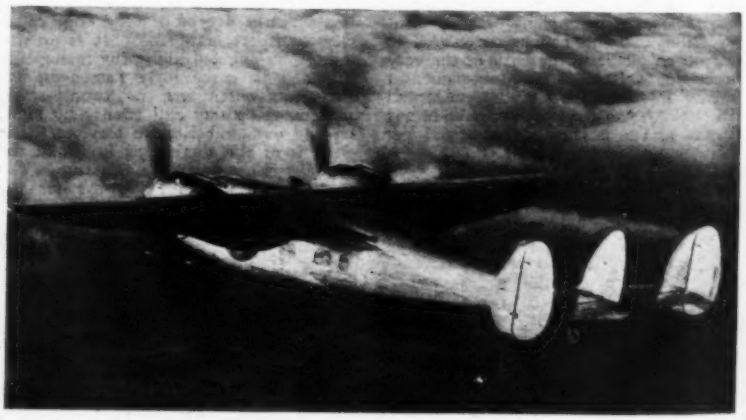
DE HAVILLAND

WITH the reasonable chance of a useful home market for the type, De Havillands have now entered the field with an all-metal medium-capacity transport machine following, with improvements, the modern formula. The D.H.95, or Flamingo, is a high-wing twin-engined machine in which safety considerations and ease of maintenance have been considered equally in the design with sheer performance. Additionally, every attempt has been made to give the maximum amount of usable cabin space so that the machine may fly practically as well as theoretically at a maximum all-up weight.

The high-wing layout was decided upon partly for passenger comfort, but largely to provide good stability, particularly near the stall. The two Perseus XIIC engines give a sufficient reserve of take-off power for the machine to fly and climb on one engine up to 8,000ft. with full load, and the single-engine climbing speed is reached within 475 yd. of the start of the take-off run. In a general way the structure follows conventional design, but the machine is equipped with Handley Page slotted flaps.

Figures for the Flamingo are given below.

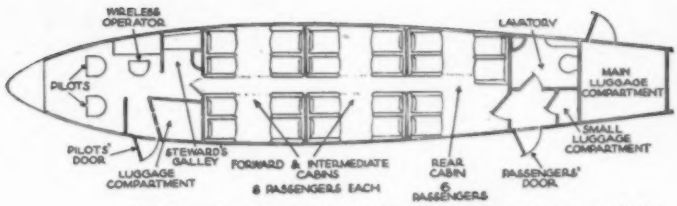
Span	... 70ft. (21.35 m.)
Length (tail down)	... 51ft. 10in. (15.81 m.)
Wing area ...	... 651 sq. ft. (60.4 sq. m.)
Undercarriage track	... 20ft. 8in. (6.30 m.)
Power loading (take-off)	9.55 lb./h.p. (4.27 kg./h.p.)
Wing loading	... 28.1 lb./sq.ft. (127.5 kg./sq. m.)
Tare weight (12 passengers, fuel for 1,000 miles)	... 11,500 lb. (5,215 kg.)
Payload ...	... 2,331 lb. (1,056 kg.)
All-up weight...	... 17,000 lb. (7,710 kg.)
Max. fuel capacity	... 410 gall. (1,860 l.)
Cruising (542 h.p. each eng. at 9,000ft.)	... 210 m.p.h. (338 km./hr.)
Max. speed (7,000ft.)...	234 m.p.h. (377 km./hr.)
Consumption (cruising 9,000ft.) ...	... 69 gall./hr. (314 m./hr.)
Range (full tanks)	... 1,250 miles (2,010 km.)
Initial rate of climb...	1,630ft./min. (495 m. min.)
Time to 10,000ft.	... 10.1 min.
Service ceiling	... 19,400ft. (5,920 m.
Take-off run (5 m.p.h. wind) ...	... 280 yd. (256 m.)
Height after 656 yd.run	170ft. (51.8 m.)
Single-engine ceiling...	7,700ft. (2,345 m.)
Initial single-engine rate of climb	... 270ft./min. (82 m./min.)



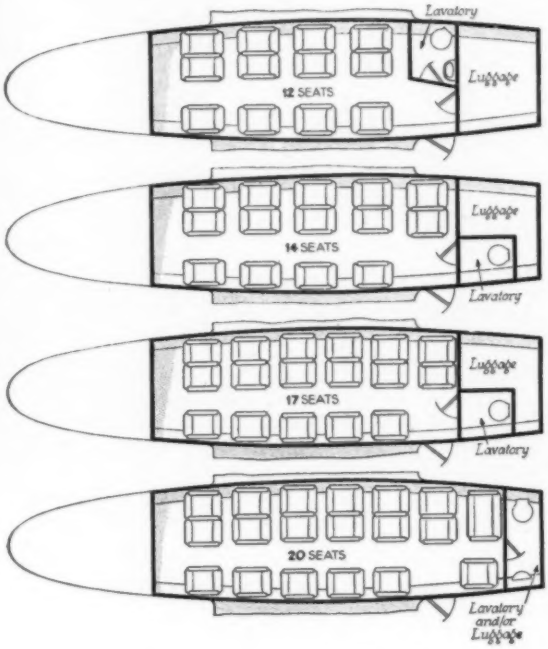
"Flight" photograph.

This country's first all-metal medium-capacity transport—the D.H. Flamingo which, like the Albatross, cruises at 210 m.p.h.

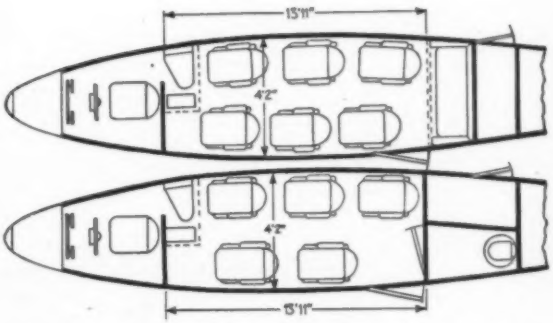
The first really large machine to be built by De Havillands, the D.H.91, or Albatross, is the most efficient machine of its size in existence. At 62 per cent. of the maximum available power—or 1,300 h.p.—the Albatross carries a payload of 4,188 lb. at 210 m.p.h. It is, in fact, at present operating the fastest scheduled commercial service in the world—though, since it is essentially a long-range machine, it is at present being somewhat wasted on the Paris run.



The seating layout of the D.H. Albatross as arranged for Imperial Airways' European services.



Four different passenger arrangements are offered for the D.H. Flamingo — depending on the type of work it is expected to carry out.



Two of the four standard seating arrangements for the D.H. Rapide. That above is for short-distance work.

The structure is entirely of wood, with interesting applications of new ideas, and the whole design may be said to have been based on that of the smaller Comet racer. The thin-section cantilever wing is of two-spar design with spruce-strip covering, and the fuselage is a monocoque structure in which a balsa wood sandwich is used to support the plywood. The engines are Gipsy Twelves, each giving a maximum of 525 h.p. at the take-off. The figures (centre column) are for the passenger-carrying version.

Span	105ft. (32 m.)
Length (tail down) ...	70ft. (21.34 m.)
Wing area	1,078 sq. ft. (100.15 sq. m.)
Power loading ...	13.9 lb./h.p. (6.40 kg./h.p.)
Wing loading ...	27.4 lb./sq.ft.(133.77 kg./sq.m.)
Weight empty (with equipment)	21,230 lb. (9,642 kg.)
Payload (1,000-mile range)	4,188 lb. (1,899 kg.)
Cruising speed (11,000 ft.)	210 m.p.h. (338 km./hr.)
Max speed (8,750ft.) ..	225 m.p.h. (362 km./hr.)
Take-off run (5 m.p.h. wind)	385 yd. (352 m.)
Initial rate of climb...	1,018ft./min. (5.17 m./sec.)
Service ceiling ...	17,900ft. (5,455 m.)
Absolute ceiling (two engines on one side stopped)	5,000ft. (1,524 m.)

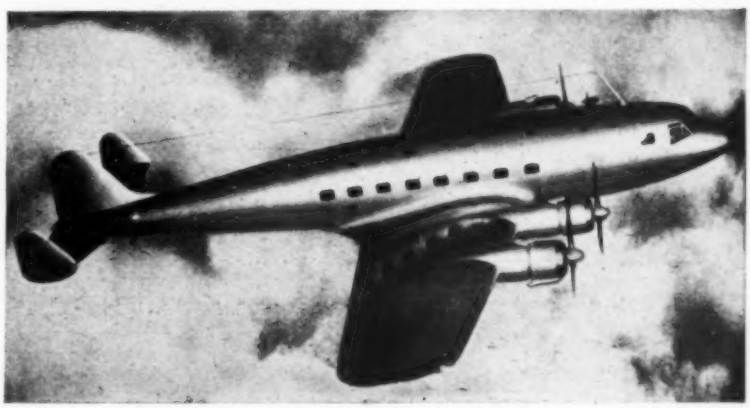
Designed for use by smaller operators or on branch-line services, the D.H.89, or Rapide, has a reputation for economy in a somewhat different sphere. In spite of the fact that this twin-engined all-wood biplane is perhaps somewhat old-fashioned according to present ideas, it is still being manufactured in considerable numbers for use on airlines throughout the world. That is proof of its practicability. The engines are Gipsy Sixes of 200 h.p.

Span	48ft. (14.63 m.)
Length	34ft. 6in. (10.52 m.)
Wing area	336 sq. ft. (31.2 sq. m.)
Weight empty (inc. equip.)	3,230 lb. (1,466 kg.)
Disposable load	2,290 lb. (1,040 kg.)
All-up weight	5,550 lb. (2,520 kg.)
Maximum speed	155 m.p.h. (250 km./hr.)
Cruising speed	132 m.p.h. (212.5 km./hr.)
Take-off run	290 yd. (265 m.)
Initial rate of climb ...	867ft./min. (265 m./min.)
Ceiling	16,700ft. (5,100 m.)
Ceiling (one engine) ...	3,100ft. (945 m.)
Range	556 miles (895 km.)

Makers: The De Havilland Aircraft Co., Ltd., Hatfield Aerodrome, Herts.

FAIREY

ONE of the most interesting commercial machines in course of construction is the Fairey F.C.1, fourteen of which have been ordered by the Air Ministry. This four-engined all-metal landplane has been designed very largely to the requirements of British Airways, and in the latter's operational department work has recently been going on in the design of the instruments and navigational equipment. Special high-lift flaps of Fairey design will be fitted to bring the effective take-off wing loading down to about 25 lb. per sq. ft.; when the flap or auxiliary wing is retracted this loading will be increased to 32 lb. per sq. ft. The machine will have a retractable



The Fairey F.C.1 four-engined transport aeroplane; it is expected to cruise at 220 m.p.h.

tricycle undercarriage and the fuselage will be designed for supercharging at altitude. The engines will be of 1,000 h.p. each—probably of the Bristol Taurus type. Provisional figures are:—

Span	105ft. (32.50 m.)
Length	82ft. (27 m.)
Wing area	1,300 sq. ft. (125 sq. m.)
Wing loading ...	32.5 lb./sq. ft. (150 kg./sq. m.)
Inside cabin length ...	32ft. (11.50 m.)
Inside cabin width ...	10ft. (3.25 m.)
All-up weight... ...	42,000 lb. (19,000 kg.)
Payload (500 miles)...	9,500 lb. (4,300 kg.)
Payload (1,700 miles)	4,500 lb. (2,050 kg.)
Range (50 p.c. power)	1,700 miles (2,750 km.)
Max. speed (13,000ft.)	275 m.p.h. (445 km./hr.)
Cruising speed (60 p.c. power)	225 m.p.h. (360 km./hr.)
Stalling speed... ...	70 m.p.h. (110 km./hr.)

Makers: The Fairey Aviation Co., Ltd., Hayes, Middx.

GENERAL AIRCRAFT

MANY years ago the original Monospar S.T.25 was sold in standard form with all essential equipment, including navigation and landing lights and a homing radio receiver. To-day the S.T.25, which is an all-metal low-wing monoplane with two Pobjoy Niagara III engines, is known as the Universal, and is designed to be rapidly convertible for passenger carrying on feeder lines, for freight carrying and for ambulance work. More recently General Aircraft have been building one of these machines with an experimental pressure cabin for full-scale tests of "air comfort" problems. When it is finished this version of the Monospar will carry a crew of two or three with all the necessary apparatus, including a supercharging unit housed in the nose of the machine. The intention is to maintain sea-level pressure in the cabin at a height of 15,000ft. Figures for the Universal are:

Span	40ft. 2in. (12.24 m.)
Length	25ft. 4in. (7.72 m.)
Span (wings folded) ...	14ft. 10in. (4.52 m.)
Wing area	217 sq. ft. (20.2 sq. m.)
Weight empty ...	1,818 lb. (826 kg.)
All-up weight... ...	2,875 lb. (1,307 kg.)
Power loading ...	15.1 lb./h.p. (6.78 kg./h.p.)
Wing loading ...	13.25 lb./sq. ft. (64.6 kg./sq. m.)
Maximum speed ...	131 m.p.h. (211 km./hr.)
Cruising speed (72 p.c. power)	115 m.p.h. (185 km./hr.)
Initial rate of climb ...	710ft. min. (216 m./min.)
Service ceiling ...	13,000ft. (3,960 m.)
Service ceiling (one engine)	3,800ft. (1,160 m.)
Range	419 miles (675 km.)

Makers: General Aircraft, Ltd., London Air Park, Feltham, Middx.

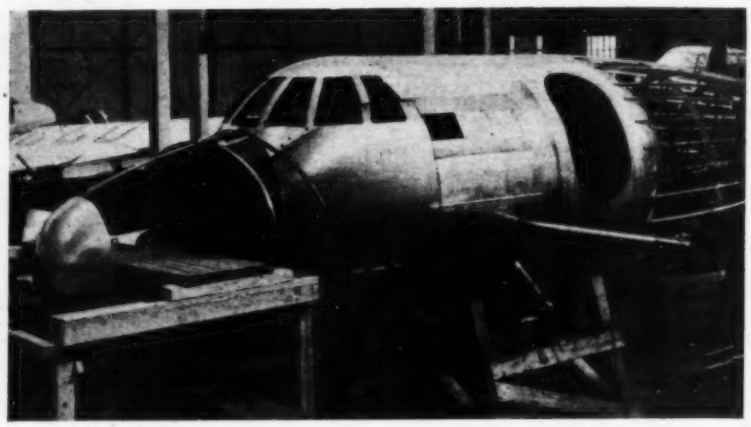
MAYO

BOTH "parts" of the prototype Mayo Composite were, of course, constructed by Short Brothers, but later composites may be built by other firms. Since Major Mayo is the originator of the scheme and developments are being handled by a special company, it is desirable to give the figures under their own heading. The idea of the scheme, briefly, is to permit a very heavily loaded machine to reach operating height with the help of another, larger, and lightly loaded aircraft. In prototype form the mother ship is a modified Short "C" class boat, and the upper component is a specially designed long-range floatplane. The figures for *Mercury*, the upper component, are:

Span	73ft. (22.26 m.)
Length	51ft. (15.6 m.)
Wing area	611 sq. ft. (56.76 sq. m.)
Weight empty ...	10,163 lb. (4,614 kg.)
Disposable load ...	10,637 lb. (4,829 kg.)
All-up weight ...	20,800 lb. (9,443 kg.)
Max. speed (5,800ft.)	212 m.p.h. (339.2 km./hr.)
Cruising speed ...	182 m.p.h. (291.2 km./hr.)
Range	3,900 miles (6,240 km.)

Makers: The Mayo Composite Aircraft Co., Ltd. 55-58, Pall Mall, London, S.W.1.

The Monospar Universal, which is convertible more or less immediately from passenger-carrying to freighter or ambulance form.



General Aircraft are building a special S.T.25 for pressure-cabin experiments: in this photograph the fuselage is shown nearing completion.

Composition: *Mercury* being loaded on to *Maia*.

PERCIVAL

OFFERING a comparatively high performance with a low power, the Percival Q4 and Q.6 twin-engined machines are cantilever low-wing monoplanes with, in the first case, Gipsy Major engines and, in the second, Gipsy VI Series II engines with c.p. or c.s. airscrews. The better-known of the two is the Q.6, which is now being produced with a retractable undercarriage. This machine, which is of all-wood construction, carries six or seven passengers with side-by-side seats for the crew. The figures for the Q.6, provided with a retractable undercarriage are given on the next page.

Span	46ft. 8in. (14.22 m.)
Length	32ft. 2in. (9.83 m.)
Wing area	278 sq. ft. (25.8 sq. m.)
Weight empty ...	3,500 lb. (1,587 kg.)
All-up weight... ...	5,500 lb. (2,494 kg.)
Maximum speed ...	203 m.p.h. (326 km. /hr.)
Cruising speed (7,000ft.)	181 m.p.h. (291.2 km./hr.)
Landing speed (flaps down)	58 m.p.h. (93.3 km./hr.)
Take-off run	200 yd. (182.8 m.)
Service ceiling ...	21,000ft. (6,553 m.)
Ceiling (one engine) ...	6,500ft. (1,981 m.)
Initial rate of climb ...	1,150ft. /min. (350.5 m. /min.)
Cruising range ...	700 miles (1,126 m.)

Apart from the Mew Gull—which is by no means a freak racing machine and carries, in one form, a payload of 483 lb. over a range of 860 miles at a cruising speed of 220 m.p.h.—the Percival Company also make the Vega Gull, which is eminently suitable for general charter work.

The Vega is a four-seater low-wing cabin monoplane with a Gipsy Six engine. The occupants are seated in two pairs, and there is ample luggage space at the rear of the cabin. The wings are foldable and the machine is fitted with effective split flaps. The figures for the c.p. airscrew (Series II Gipsy Six engine) Vega Gull are:

Span	39ft. 6in. (12.039 m.)
Length	25ft. 4in. (7.721 m.)
Span (wings folded) ...	16ft. (4.877 m.)
Maximum speed	175 m.p.h. (281 km. /hr.)
Cruising speed (sea level) ...	160 m.p.h. (258 km. /hr.)
Cruising speed (7,000ft.) ...	170 m.p.h. (274 km./hr.)
Take-off run	185 yd. (169 m.)
Weight empty	1,740 lb. (783 kg.)
All-up weight	3 250 lb. (1,460 kg.)
Standard range	660 miles (1,060 km.)
Payload (less pilot and equipment)	1,002 lb. (455 kg.)

Makers: Percival Aircraft, Ltd., Luton Airport, Luton, Beds.

POBJOY

TWO machines which have never, perhaps, received their full recognition by operators are the Pobjoy-Short Scion twin-engined feeder line machine and the Scion Senior, which is a four-engined machine for rather more serious operations. Quite a few of each, both on floats and on wheels, are used in different parts of the world.

Both of the machines are of all-metal construction and the Senior was initially built as a scale-model test machine for Short Empire boat development. The engines in each case are 90 h.p. Pobjoy Niagara III radials. The figures for the Scion Junior landplane (five passengers are normally carried when it is used for feeder-line work) are:—

Span	42ft. (12.8 m.)
Length	31ft. 6in. (9.6 m.)
Wing area	255.5 sq. ft. (23.75 sq. m.)
Weight empty	1,875 lb. (850.5 kg.)
Actual payload	1,057 lb. (479.3 kg.)
All-up weight	3,200 lb. (1,451.5 kg.)
Maximum speed ...	128 m.p.h. (206 km./hr.)
Cruising speed (3,200 r.p.m.)...	116 m.p.h. (187 km./hr.)
Landing speed 5 ...	50 m.p.h. (80 km./hr.)
Initial rate of climb ...	625ft./min. (190 m./min.)
Range (standard tanks)	390 miles (624 km.)

The figures for the Short Scion Senior in its well-known seaplane form (carrying nine passengers for airline work) are:

Span	55ft. (16.78 m.)
Length	42ft. (12.8 m.)
Wing area	400 sq. ft. (37.2 sq. m.)
Weight empty (with equipment)	4,058 lb. (1,842 kg.)
Payload (with pilot) ...	1,153 lb. (523 kg.)
All-up weight	5,750 lb. (2,610 kg.)
Maximum speed ...	135 m.p.h. (216 km./hr.)
Cruising speed (3,200 r.p.m.)...	120 m.p.h. (192 km./hr.)
Landing speed	55 m.p.h. (88.5 km./hr.)
Initial rate of climb ...	615ft./min. (188 m./min.)
Service ceiling on three engines	5,500ft. (1,675 m.)
Range (standard tanks)	400 miles (645 km.)

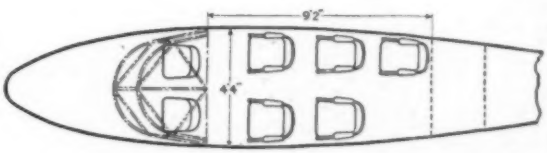
Makers: Pobjoy Airmotors and Aircraft, Ltd. Rochester, Kent.

"Flight" photograph.

In its latest retractable-uncarriage form—the Percival Q.6, which has a maximum speed of more than 200 m.p.h. on the Gipsy Six engines.

(Above) Hardly in the transport class, but nevertheless a useful type for charter and feeder-line work—the Percival Vega Gull.

(Right) The Percival Q.6 cabin as laid out for airline work. A toilet compartment may be arranged in place of the seventh seat.



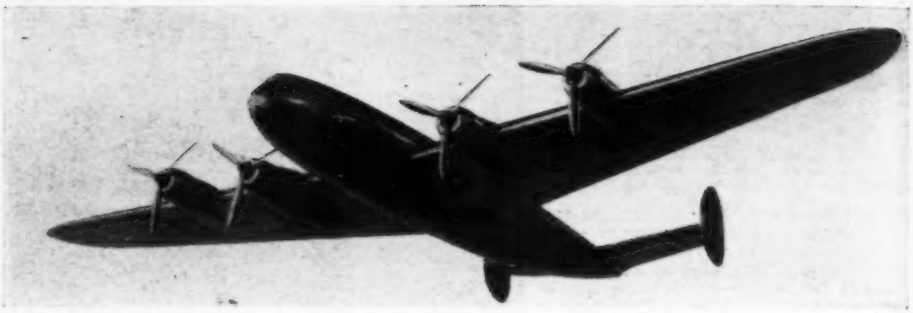
"Flight" photographs.

SHORT

IN many ways the design and production of the large series of "C" class boats for Imperial Airways by Short Brothers was one of the most remarkable of post-war manufacturing achievements. The order was given, so to speak, off the drawing board, the first boat of the series made successful tests in July, 1936, and the initial order of thirty-one boats was completed some eighteen months later.

In design the standard "C"-class boat is a high-wing stressed-skin cantilever monoplane with a two-step hull of typical Short construction. The original series were fitted with Bristol Pegasus Xc engines with a maximum output of 790 h.p., but the later series of strengthened boats have been fitted with Bristol Perseus XIIc sleeve-valve engines. The latter have been designed for refuelling and will be used both on the North Atlantic service and on that from Australia to New Zealand. The figures for the Trans-Tasman type of Empire boat are:

The landplane version of the Pobjoy-Short Scion Senior being demonstrated with its two outboard engines throttled back.



A model of the big Short landplane, three of which have been ordered by the Air Ministry — two for normal and one for high - altitude work.

Span	114ft. (34.77 m.)
Length	88ft. (26.84 m.)
Wing area	1,500 sq. ft. (139.35 sq. m.)
Normal all-up wt. ...	46,000 lb. (20,800 kg.)
Special all-up wt. ...	48,000 lb. (21,700 kg.)
Refuelling all-up wt. ...	53,000 lb. (24,000 kg.)
Payload	6,000 lb. (2,720 kg.)
Max. speed ...	195 m.p.h. (313 km./hr.)
Max. range (against 40 m.p.h. wind at 160 m.p.h.)	1,300 miles (2,080 km.)
Range of Atlantic type (against 40 m.p.h. wind at 150 m.p.h.)	2,500 miles (4,000 km.)

In the meantime three very much larger boats are in course of construction, and the first of these should appear in a few weeks. In general design these "G"-class boats, as they are designated, will be somewhat similar to the "C"-class boats, but will be fitted with four of the new 1,380 h.p. civil-rated Bristol Hercules sleeve-valve radials. The figures for the "G"-class boat are:

Span	134ft. 4in. (41 m.)
Length	101ft. 4in. (30.9 m.)
Wing area	2,160 sq. ft. (201 sq. m.)
Weight empty ...	37,600 lb. (17,056 kg.)
Disposable load ...	34,400 lb. (15,614 kg.)
All-up weight ...	72,000 lb. (32,660 kg.)
Payload (1,000-mile range at 70 p.c. power)	24,100 lb. (10,900 kg.)
Wing loading ...	33.3 lb./sq. ft. (163 kg./sq. m.)
Power loading ...	13 lb./h.p. (5.98 kg./h.p.)
Maximum speed ...	295 m.p.h. (330 km./hr.)
Cruising speed (70 p.c. power, 5,000ft.) ...	180 m.p.h. (210 km./hr.)
Range	3,200 miles (5,150 km.)

Towards the end of last year the Air Ministry announced that three large landplanes had been ordered from Short Brothers, two for operations at more or less normal heights, and one for high altitude work with a pressure cabin. These machines, again, will be fitted with four Bristol Hercules engines of 1,600 h.p. and are of the high-wing type. The provisional figures for the 14/38 landplane (as the new type is to be known) are:

Span	127ft. 6in. (38.6 m.)
Length	89ft. (27 m.)
Wing area	1,800 sq. ft. (167.2 sq. m.)
Weight empty (standard) ..	39,050 lb. (17,650 kg.)
Weight empty (high altitude)	41,310 lb. (18,700 kg.)
Payload with crew (standard)	8,000 lb. (3,630 kg.)
Payload with crew (high-altitude)	8,800 lb. (3,980 kg.)
All-up weight (both) ...	71,000 lb. (32,200 kg.)
Cruising speed (10,000ft.) ..	246 m.p.h. (395 km. /hr.)
Cruising speed (25,000ft.)...	275 m.p.h. (440 km. /hr.)
Service ceiling (standard) ..	20,200ft. (6,130 m.)
Service ceiling (high altitude)	32,500ft. (9,880 m.)
Range (standard)	3,420 miles (5,470 km.)
Range (high altitude) ...	3,370 miles (5,400 km.)

Makers: Short Brothers (Rochester and Bedford), Ltd., Rochester.

The first of the strengthened C-class Short boats on an early test outing. *Cabot*, which will be used for refuelled Atlantic experimental flights.

"Flight" photograph.

MANCHESTER AND THE AIRLINES

ALTHOUGH work is still going on in the development of Manchester's new airport at Ringway, this is now quite ready for all comers. It was actually opened last summer and, though a full year's working is not yet complete, the traffic, actual and prospective, is being closely watched by the airport committee and it is quite possible that a central office may be set up in the city itself to deal with nothing but airport business.

The preliminary announcements of this summer's internal airline plans suggests that Manchester will be quite well served, but both the airport committee and the Manchester Chamber of Commerce think that it should be possible, with Ringway so centrally placed in the country, for travellers to leave Manchester at a reasonable hour in the morning and to make a stay of six or eight hours in any of the larger towns in this country and Scotland, before returning on the same day.

Recently the Manchester Chamber of Commerce issued a lengthy memorandum on the subject of airline needs. In brief, the memorandum urged the Government to do something about the old Maybury junction scheme and demanded guidance from the Air Ministry—complaining that the internal air routes have so far been built up without any guiding principle or policy.

After explaining the city's airline aspirations, dealing with the Maybury Report, complaining of lack of policy, describing the advantages of Ringway itself, outlining the industrial, commercial and private interests which are awaiting airline facilities, and explaining the need for adequate propaganda for commercial aviation, the memorandum summarises its conclusions and recommendations on, more or less, the following lines:—

(a) The unsatisfactory state of the airlines should be brought to the notice of the Air Transport Licensing Authority. (b) The same authority should prevent any stabilisation of the present unsatisfactory state of the airline system. (c) Individual airline operators should be approached in order that the Manchester potentialities can be explained. (d) Efforts should be made to secure Parliamentary support for the various objects set out in the memorandum. (e) A list should be made of the various firms which might make use of good air services. (f) A special propaganda fund, to which interested parties would contribute, should be established. (g) Such propaganda should be put into action before the opening of the 1939 airline "season." (h) The establishment of a central office in Manchester, the function of which would be to provide essential information about air travel, and to serve as a freight collection depot (i) Efforts should be made to attract the general public to Ringway by the provision of flying and other facilities, and by improving the communications between the airport and the city.

FROM the CLUBS and SCHOOLS

DONCASTER.
OVER 55 hr. were flown last week. Mr. G. C. Hill has gone solo, while Messrs. J. Sprague and E. Brooke Moorhouse have passed their "A" licence tests.

IPSWICH.
In spite of high winds 37 hr. were flown during the week ended April 18.

PORTSMOUTH.
The total flying time since April 1 amounted to 231 hr. Forty-six C.A.G. members are now flying solo, while 155 are under instruction.

NOTTINGHAM.
The club will hold a flying display at Tollerton aerodrome on June 25.

MARSHALLS.
The total flying time during the past week amounted to 104 hr. 30 min. Miss R. O. Neale has gone solo, while Messrs. K. P. Glassborow and A. N. Christie have passed their "A" licence tests.

NORTHAMPTONSHIRE.
New flying members include Messrs. A. J. Sharman, J. B. Simpson and Dr. R. P. White. Three machines visited Brooklands for the "dawn patrol" last Sunday. Mr. S. R. Atkins has gone solo.

PLYMOUTH.
Rain and high winds prevented flying on all but two days during the week ended April 18. However, 40 hr. were recorded, and Mr. G. V. Dungey went solo.

WESTON.
The club was particularly unlucky with the weather and suffered all the week from high winds. Flying time during the period April 12-18 amounted to 23 hr.

BEDFORD.
High winds last week considerably affected the flying times. Four new members have joined the club. Messrs. W. H. Sands and W. H. Carr have gone solo.

YAPTON.
Since April 1 139 hr. have been recorded. A Spartan Arrow has been added to the club fleet, bringing the total up to five aircraft. Eight C.A.G. members have qualified for their "A" licences.

NORWICH.
During the week ended April 22 C.A.G. members logged 81 hr. Messrs. A. Hailey and F. J. Ingram commenced their training last week.

WITNEY.
Flying time for last week amounted to 37 hr. 20 min. The first series of lectures for C.A.G. members has been completed, and a second series for new members will start shortly.

CAWNPORE AND LUCKNOW.
Mr. M. V. Namjoshi has passed the test for his instructor's licence, while Mr. J. Mathai is studying for the same licence. Messrs. R. U. Fuller and T. I. Smith chartered the Fox Moth twice last month.

WEST SUFFOLK.
During the week ended April 23, 26 hr. were flown. Mr. B. T. Hardy has passed his "A" licence tests. Capt. Charles Wilson paid the Club a visit last week. A lecture was given last Thursday to C.A.G. members by Mr. C. N. Prentice.

STRATHTAY.
High winds restricted flying activities last week. Only 16 hr. were recorded. Mr. A. B. Mitchell has joined the Club as a temporary pilot member. Mr. D. F. Cargill has passed his instructor's tests.

LANCASHIRE.
Over 57 hr. were flown during the period April 13-19. Messrs. F. R. Robertson, J. C. Byrom, W. L. Boon and Miss Margaret Vernon have gone solo. It has been decided that the club C.A.G. unit shall enter for the Londonderry Challenge Shield Competition.

EASTBOURNE.
During the week ended April 14, 64 hr. were logged. Miss P. Woollam passed her "A" licence tests, while Mr. P. H. Olliff went solo. Mr. D. L. Brown won the Chambers Trophy bombing competition. Mr. T. P. Murray Lees was second.

EXETER.
Over 250 members and friends of the Exeter and Plymouth clubs attended the ball held at Torquay on April 14. Sixty-two hours were recorded last week. Messrs. P. H. Lawson, H. J. Pendleton and W. M. Carey went solo.

EDINBURGH.
Flying time during the month of March amounted to 109 hr., of which 33 hr. were flown by club members. Four C.A.G. members have passed their "A" licence tests. Mr. R. L. Jeffery has joined the staff as assistant instructor.

HYDERABAD.
A total of 46 hr. was recorded last month. Mr. R. S. Ponday and Lt. S. K. Ali Zaidi have passed their "A-1" and "A" licences respectively. Messrs. N. N. Somayajulu, Ibraheenal Khalil and J. L. Sircar have joined as new members.

MADRAS.
Messrs. Raju, Barnabas and Soundararajan have gone solo, while Mr. Pieris has renewed his "B" licence. Dr. Dyson won the monthly landing competition, with Mr. Avadiappa Chettiar in second place.

BRISTOL AND WESSEX.
Last week 68 hr. were recorded. Messrs. F. W. Chester and D. L. Clarke have gone solo, while Mr. D. W. Brokenbrow has passed his "A" licence tests. A new series of C.A.G. lectures started this week. There will be a special enclosure for Club members on Empire Day.

THANET.
During the week ended April 18, 59 hr. 30 min. were recorded. Mr. W. W. Mills has passed his "A" licence tests, while Messrs. A. Poupard and W. Lingford have gone solo. The last named is the organiser of the Ramsgate Flying Centre (there are plenty of tents and the C.A.G. unit is still able to take on new members).

LONDON.
The flying time for last week amounted to 158 hr. Miss D. Dickinson, Messrs. J. N. I. McIntyre, A. C. Maxwell and G. W. Duckmanton have gone solo. Mrs. I. S. Haslewood, Messrs. S. C. Bentley, D. H. Jeffs, A. G Anderson, H. C. Lawrence and L. W. Darley passed their "A" licence tests.

YORK AND LEEMING.
C.A.G. members logged over 52 hr. last week. Messrs. G. W. Grant, F. Micklethwaite, R. H. Harwood, and D. W. Chisholm have gone solo, while Messrs. K. A. Horner, G. A. Theyer, E. Kirby, J. Kitching and J. C. Atkinson have passed their "A" licence tests.

ROMFORD.
An inspection of the C.A.G. section, the National Women's Air Reserve and the No. 6 (Romford) Sqn., A.D.C.C., was carried out last Sunday by the Mayor of Romford, Ald. R. A. Forge, accompanied by aldermen and councillors, at Maylands aerodrome. During the inspection the A.D.C.C. Sqn. was presented with its colours.

HANWORTH.
On next Sunday, April 30, a "dawn patrol" will be held between 8 a.m. and 8.45 a.m. Last week Club aircraft flew 135 hr. 15 min. Messrs. A. Bollington, D. Holcombe, D. Fenn, F. Cole and T. Blay went solo, while Messrs. P. Masefield, H. Battersby, D. Mitchell, I. Gunn and Miss J. M. Gordon-Luhrs have passed their "A" licence tests.

REDHILL.
Flying time for the fortnight ended April 22 amounted to 232 hr. 35 min. Messrs. B. Whiting and W. J. Monk have passed their "A" licence tests, while Mr. W. P. Rochfort accomplished his "B" licence night flight. Messrs. L. Alexander, H. A. Bartram, W. V. Walford, C. M. Cooper, C. J. Pritchard and Miss D. Moran have gone solo.

CINQUE PORTS.
Flying time for last week amounted to 66 hr. Messrs. Sutherland and Taylor passed their "A" licence tests, while Messrs. Boulden and P. Cooper went solo Last Sunday a luncheon visit was paid by members of No. 601 Sqn. The club's Leopard Moth was chartered by members of the Press for taking photographs of the German fleet last week.

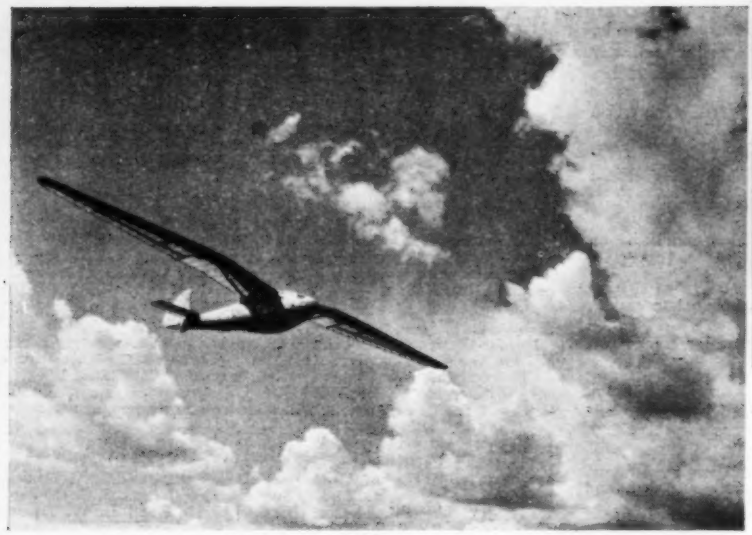
BROOKLANDS.
Flying time for last week amounted to 135 hr. Mr. D. Surridge has passed his "A" licence tests. Last Sunday 45 aircraft from eleven clubs took part in the "dawn patrol." All but five were accounted for by the 14 defenders. Private owners from Brooklands are giving their support to the Weybridge Air Observers' Corps by flying along certain courses on Sunday mornings. Over £70 was collected for the A.D.C.C. last week.

A C.A.G. Dawn Patrol

ON April 30 the London Air Park Flying Club is inviting all other clubs to the normal type of dawn patrol. In this case, however, the private members of the defending club are each taking one C.A.G. member up as a passenger in order to give them some experience in spotting other machines, and the Hanworth Club suggests that visiting machines might be similarly equipped in the matter of personnel. The zero period is between 8 and 8.45 a.m.

Incidentally, the London Air Park Flying Club is inviting all its C.A.G. members to the dance which is being held in the Hanworth Park Hotel at 8 p.m. on May 12.

HERE and THERE



(Left) A Kirby Gull—built by Slingsby Sailplanes—of the type in which Mr. J. H. Stephenson reached France from a winch-launch at Dunstable. He is seen above in the Kirby Kite which he previously owned.

C.A.G. Camp

So far three clubs have indicated their intention to arrange special summer camps for C.A.G. members. These are the Wiltshire School of Flying—details of their plans have already been given—the Bournemouth Flying Club and the Grimsby Aero Club. The attendance at these camps will be limited to those who are staying for a length of time sufficient for them to obtain their "A" licences—for which at least one month should be allowed. Nevertheless, those pupils who are high up in their club's waiting list, and can bring a statement from the club to say that their training will be continued if uncompleted, are also eligible to join.

In the meantime the C.A.G. commissioners wish to clarify the situation in the matter of the closing of the lists. This does not mean that new units should not be encouraged to form in suitable localities, and, in any case, some nineteen clubs are now ready to accept new members for early training.

Incidentally, the commissioners also note with regret that "the C.A.G. uniform is not being widely worn." They explain that the uniform is compulsory and must be worn when flying and on other occasions when ordered—which is a little hard on those other club members who have joined the C.A.G. and must wear, apparently, this cumbersome boiler suit when flying in closed machines on ordinary cross-countries. Surely the uniform should only be compulsory in the case of trainees.

Capt. Harold Balfour, Under-Secretary of State for Air (and a very accomplished pilot), paid a visit last Friday to Rootes' shadow factory at Liverpool. He is seen examining Blenheim tail-trimming controls in company with Mr. W. E. Rootes (right), chairman of Rootes' Securities, and Mr. Trowbridge, works manager of the factory.

Unassisted Cross-Channel

With the help of a very strong north-westerly wind last Saturday, Mr. G. H. Stephenson, a member of the London Gliding Club, managed to reach Boulogne from Dunstable. He was launched at about 3 p.m. by an ordinary winch to a height of 400ft. in his own Kirby Gull sailplane, and he landed in France, about nine miles east of Boulogne, some three hours later. Curiously enough, his original intention was to fly to the Surrey Gliding Club site at Reigate, but evidently he decided that the conditions were much too good to miss, since, even with no thermal assistance while crossing the Channel, he should have lost no more than 3,000ft. in the short period—about a quarter of an hour—which was taken to fly between Folkestone and Calais.

Incidentally, it was reported on the same day that a German sailplane pilot had established a new long-distance record with a flight of 225 miles from Chemnitz to Vienna. Herr Bräutigam, the pilot, left the gliding school at Gross-Rückerswalde.

Next Thursday's R.Ae.S. Lecture

Next Thursday, May 4, Mr. H. L. Cox, M.A., will read a paper on "Stress Analysis of thin Metal Construction" before the R.Ae.S.

The paper begins with the stress analysis of the buckling of panels, flat and curved, and continues with investigation into the stress analysis of cylinders in bending, and the problem of the monocoque fuselage. The ultimate stress carried by stringers attached to sheet, the stress analysis of cylinders in torsion; and the effect of holes and concentrated loads are discussed.

The paper will be read at 6.30 p.m. at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

Still at It

Air France-Transatlantique's flying boat, the *Lieutenant de Vaisseau Paris*, born in 1928, sunk in a storm, salvaged and reconditioned, refloated and now fitted with six new engines, is still going strong. In preparation for a series of North Atlantic crossings this summer, via Lisbon and the Azores, it is being thoroughly tested at the Etang de Biscarosse, and last week it took off in 45 seconds when loaded up to a weight of 41,500 kilos. The new engines are Hispano Suiza 12 Y 37s. of 920 h.p. each.

The *Lieutenant's* sister-ship, the *Ville de Saint Pierre*, incorporating many important modifications and brought up to date, is due to make her first flight at any moment now. These two flying boats will continue to make reconnaissance voyages across the North Atlantic by the Southern route pending the completion of the 66-tonners, the Latécoère 631 and two S.E.200s.

SERVICE AVIATION

Royal Air Force and Official Announcements : *Fleet Air Arm News : Military Aviation Abroad*

The Blackburn Roc

IT is now permissible to publish some details of the Blackburn Roc, which may be described as a version of the Skua adapted as a two-seater fighter for the Fleet Air Arm and designed to take either a retractable wheel undercarriage or a fixed float undercarriage. The engine is a Bristol Perseus sleeve-valve.

Like the Skua, the Roc is of monocoque stressed-skin construction, and water-tight compartments are provided in the fuselage and wings. It also has the distinctive tail unit of the Skua, with the fin and rudder set forward of the horizontal surfaces.

A pilot and an observer-gunner-radio-operator are accommodated in a long enclosed cockpit, at the rear end of which is a power-operated turret. There are hinged fairings fore and aft of the turret.

The retractable undercarriage folds outwards and upwards into recesses in the wings. When floats are fitted, water rudders are operated by the same pneumatic system which would operate the brakes when a wheel undercarriage was fitted.

The Roc is of 46ft. span, 35ft. 7in. length, and 12ft. 11in. overall height. A photograph appears on p. 414.

The Defiant I

THE version of the Boulton Paul Defiant two-seater fighter adopted as the standard machine in this class in succession to the Hawker Demon will, according to an official announcement, be known as the Defiant I. It is powered with a Rolls-Royce Merlin engine and carries its armament in a power-driven turret.

Rolls-Royce Engine Types

THE Hurricane I and Spitfire I eight-gun fighters and the Battle I single-engined bomber types may be fitted with a Merlin III engine in place of the usual Merlin II. The Merlin III is similar to the earlier model but embodies a drive from the front half of the crankcase for a Pesco pump and has a constant-speed unit for a Rotol airscrew.

The Kestrel XXX, installed in the Miles Master two-seater advanced trainer, has been developed from earliest Kestrel parts with a number of modifications.

Civilian Wireless Personnel

A NEW scheme whereby civilian radio enthusiasts may make their contribution to National Defence and at the same time obtain valuable experience in aeronautical communications and in the operation and maintenance of the most modern radio apparatus has been introduced by the Air Ministry.

To meet the immediate requirements for large numbers of trained wireless operators and wireless electrical mechanics in the expanded R.A.F., is has been decided to augment the supply of personnel by the employment of a number of civilians.

Applications are accordingly invited from candidates with a practical experience of wireless, including those who have gained their knowledge and experience as amateurs. The selected candidates will be employed as civilians at Royal Air Force Stations at home, as near as possible to the districts which they choose. The applications should be addressed to the Under-Secretary of State (S.5.f), Air Ministry, London, W.C.2.

Applicants must be capable of sending and receiving accurately in the Morse code at 20 words per minute and should have had experience of W/T. communication. It is also necessary to have a general knowledge of electricity, radio receivers and their principles of operation and tuning. The rate of pay for this trade is from 60s. per week, with an annual increase of 3s. per week up to a rate of 75s. per week.

Civilian wireless and electrical mechanics must be qualified as wireless operators, and must also be capable of installing, maintaining and repairing wireless and electrical equipment both for aircraft and ground stations. The duties involve testing and servicing aircraft transmitters and receivers and their associated equipment such as batteries, generators, etc. The rate of pay for this trade is from 75s. per week with an annual increase of 3s. per week up to a rate of 90s. per week.

Neither operators nor mechanics will be required to carry out flying duties. Operators normally undertake radio watchkeeping and communications with aircraft and ground stations.

The appointments will be on a temporary basis, although a proportion of suitable applicants are likely to be retained for some years. The rates of pay are inclusive and men engaged will, as in other civil employments, find their own lodging, food and clothing. Civilians employed in the Royal Air Force may use their Station canteen and make purchases at their Station Institute grocery shop. They are also eligible to avail themselves of the Station recreational facilities.

R.N.V.R. Air Branch Officers

IN future the period of full-time training for officers of the Air Branch of the Royal Naval Volunteer Reserve who are appointed for observer duties will be reduced from 18 to 10 months. Additional vacancies for observer officers in this branch will shortly be available; full details may be obtained from the Secretary of the Admiralty (C.W. Branch) or from the Commanding Officer of any R.N.V.R. Division.

Golf

IT has been found necessary to alter the dates of the Spring Meeting of the R.A.F. Officers' Golfing Association. According to the new arrangements the meeting will be held at the Ashridge Golf Club, Little Gaddesden, Berkhamsted, Herts, on May 1, 2 and 3. Particulars may be obtained from the Honorary Secretary, Sqn. Ldr. C. H. Hayward (retd.), 127, Chatsworth Court, London, W.8.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

F/O. (A.Flt. Lt.) Dennis Thomas Collins and A.P/O. Frank Brian Stiven (both flying solo) lost their lives in a collision in the air which occurred at Caterham-on-the-Hill on April 18 between two aircraft of No. 3 Squadron.

P/O. Charles Edward Jones (flying solo) lost his life in an accident which occurred near Hull on April 20 to an aircraft of No. 144 Squadron.

F/O. Charles Auston Rotherham (flying solo) lost his life in an accident which occurred near Chichester, Sussex, on April 22, 1939, to an aircraft of No. 43 Squadron.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

T. J. Edwards (from Reserve) is granted a short-service commission as Pilot Officer on probation (April 3).

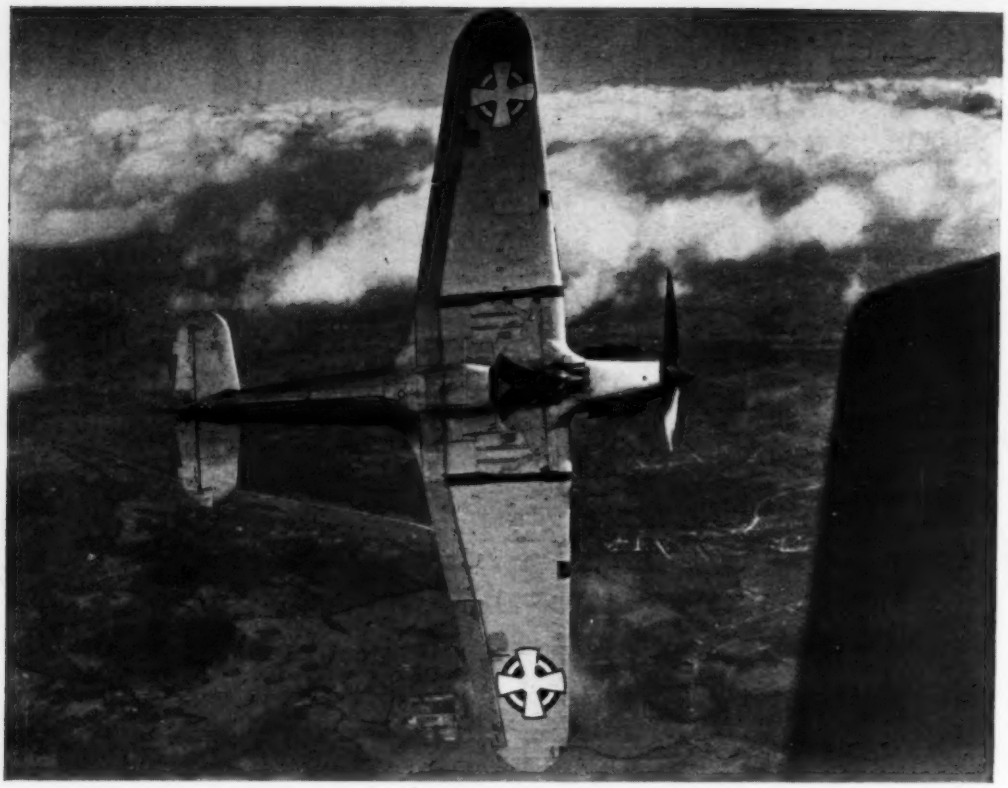
The following are granted short-service commissions as Acting Pilot Officers on probation (April 1):—W. Armstrong, G. W. Ashby, R. H. Ashton, H. F. Auger, A. C. Bartley, G. F. A. Barwell, R. E. Bary, R. P. Beaumont, L. W. Bennett, F. A. Bishop, R. C. Brown, J. Bryson, N. N. Campbell, J. C. Carriere, P. S. Charles, K. B. Chiazzari, D. G. Clift, D. H. E. Coker, J. E. M. Collins P. W. Comely, F. H. Craig, E. E. Crompton, H. K. A. Drummond, M. V. Dugdale, H. P. M. Edridge, H. D. Edwards, N. Ewart, P. C. Fraser, P. J. Gard, J. R. Gard'ner, J. H. Gilling, J. T. Glover, C. F. Gray, R. G. M. Harmston, D. S. R. Harriman, H. P. Hill, P. H. Hugo, W. J. Jarvis, J. R. Kemp, S. C. Ladyman, R. G. Lewis, P. F. N. Lomax, K. R. Lucas, H. M. MacGregor, R. B. Macgregor, G. Massey-Sharpe, T. C. McGillivray, A. C. Meigh, A. G. W. Merewether, A. W. Millson, J. G. Mitchell, C. J. M. Montagu, R. T. Mulligan, E. R. Mullins, J. D. Mundy, M. A. Newling, V. F. B. Pike, P. H. O'C. Rainier, C. A. S. Ring, J. R. Ritchie, R. A. Sanders, L. D. M. Scott, R. W. Shrewsbury, P. J. Simpson, K. D. Small, K. R. K. Smettem, E. A. Snow, B. G. Stapleton, K. T. H. Stoney, J. E. Storrar, J. G. Topham, E. C. J. Wakeham, T. J. Warner, G. E. Weston, P. L. Whitaker, A. D. White, J. A. Whitecross, R. J. Whitmarsh, D. G. Williams, D. F. Wilson, H. G. Yelland.

The following Pilot Officers on probation are confirmed in their appointments on the dates stated:—D. L. Cartridge, R. J. B. Renison (March 26); C. R. Hattersley, R. Stevenson (April 4).

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers (April 4):—W. B. Adamson, D. R. Bagnall, P. A. S. Baker, F. N. Barber, G. H. Bellamy, R. Bicknell, P. K. Bone, M. P. Brown, A. E. Bull, J. R. Canham, T. F. C. Churcher, A. M. Cooper-Key, J. W. Cutts, W. D. David, A. G. Davies, H. D. Dixon, J. F. Drummond, B. O. Egan-Wyer, D. A. R. Elliott, K. H. A. Ellis, J. A. Ferguson, P. R. A. Ford, J. E. A. Friend, J. P. Gilliard, M. J. C. Harwood, V. Hill, G. Holloway, P. R. Johnson, B. S. Jones, D. A. C. Keating, W. E. V. Malins, D. P. Massey, R. H. Moore, J. A. Newington, J. R. Noble, J. J. O'Meara, T. R. Pierce, A. D. Pilcher, F. M. G. Scotter, M. K. Sewell, M. J. A. Shaw, R. D. Shepherd, I. B. Small, P. G. Sooby, J. T. Strang, H. Thompson, J. A. Turner, J. Waddingham, J. Wallace, F. A. Walton, P. W. M. West, H. E. White, B. Willoughby, M. S. J. Wilton.

Acting Pilot Officer on probation R. W. A. Gibbs is graded as Pilot Officer on probation (December 20, 1938).

The following Flying Officers are promoted to the rank of Flight



HURRICANES FOR YUGO-SLAVIA. It may be remembered that Yugo-Slavia purchased a batch of Hawker Furies some time ago. The excellent service which these have given has, no doubt, induced that country to purchase (and ultimately to build under licence) the Hurricane. This *Flight* photograph shows one of the machines "posed" at a striking angle by Flt. Lt. R. C. Reynell, one of the Hawker test pilots.

Lieutenant on the dates stated:—W. E. Surplice, G. B. M. Bell (March 14); A. Flowerdew, K. S. Batchelor (March 24); R. D. Welland (March 26); W. G. Wells (Acting Flight Lieutenant), E. T. T. Nelson, F. A. Holmes, D.F.C. (Acting Flight Lieutenant), D. C. Smith (Acting Flight Lieutenant) (April 14).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—P. L. Dakeyne (February 3); R. F. Weatherill (March 8); R. H. Batt (March 13); E. G. Winning, E. G. F. Chivers (March 24); R. J. Reed (March 26); O. L. Williams (March 29); G. V. W. Davies, B. A. Coventry, P. Campbell, A. F. Barber (March 31); K. B. T. Burns, D. MacKenzie, C. H. Clark, R. C. Graveley, G. Edwards (April 12); M. I. Murdoch, A. A. Proctor, C. A. Harris (April 13).

Wing Cdr. A. Durston, A.F.C. (since promoted), is granted the acting rank of Group Captain (paid) on appointment as Deputy Director of Operations (Naval Co-operation) (December 29, 1938); Wing Cdr. H. E. P. Wigglesworth, D.S.C. (since promoted), is granted the acting rank of Group Captain (unpaid) on appointment as Deputy Director of Intelligence (December 22, 1938); Wing Cdr. A. C. Collier is granted the acting rank of Group Captain (unpaid) on appointment as Deputy Director of Plans (December 22, 1938).

F/O. L. E. Abey relinquishes the acting rank of Flight Lieutenant (March 27); P/O. C. Scragg relinquishes the acting rank of Flight Lieutenant (March 27); P/O. J. E. Boulton relinquishes the acting rank of Flight Lieutenant (March 29).

P/O. J. F. Roberts takes rank and precedence as if his appointment bore date November 24, 1938. Reduction to take effect from March 6.

P/O. K. R. Russell relinquishes his short-service commission on account of ill health (April 14).

The short-service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty (April 13):—M. D. Mackenzie, A. W. Wardrope.

Equipment Branch

Group Capt. E. W. Havers is promoted to the rank of Air Commodore (April 1).

The short-service commission of Acting Pilot Officer on probation A. D. Bertram is terminated on cessation of duty (April 15).

Accountant Branch

W/O. C. E. Buddin is granted a commission as Flying Officer on probation with effect from April 3 and with seniority of March 27; Flying Officer on probation R. W. Marson is confirmed in his appointment (March 28).

F/O. W. E. Hicks is placed on the retired list on account of ill-health (April 18).

Flt. Lt. F. J. S. Short is removed from the retired list (April 5).

Medical Branch

R. J. A. Morris, M.B., Ch.B., is granted a short-service commission as a Flying Officer for three years on the active list and is seconded for duty at the Royal Infirmary, Dundee (April 5).

Royal Air Force Reserve

Reserve of Air Force Officers

General Duties Branch

Flt. Lt. W. E. P. Johnson, A.F.C., is granted a commission as Flight Lieutenant in Class A with effect from April 4 and with seniority of May 26, 1934; Lt.-Col. E. A. Bald, M.C. (I.A. Ret.), is granted a commission in Class CC as Wing Commander (March 9); Lt. H. F. Game, A.F.C., is granted a commission in Class CC as Flight Lieutenant with effect from March 1 and with seniority of February 4, 1938; F/O. E. N. Fenton is granted the acting rank of Flight Lieutenant in class CC (March 1); Flt. Lt. R. H. Younghusband is transferred from class A to class C (August 26, 1938); P/O. C. J. Laubscher is transferred from class AA to class C (January 29); P/O. T. J. Edwards relinquishes his commission on appointment to a short-service commission in the Royal Air Force (April 3).

Royal Air Force Volunteer Reserve

General Duties Branch

G. S. Waller is granted a commission as Flying Officer with effect from April 11 and with seniority of October 11, 1935.

Auxiliary Air Force

General Duties Branch

No. 931 (HAMPSHIRE) (BALLOON) SQUADRON.—N. J. Hulbert M.P., is granted a commission as Squadron Leader and appointed to the command of the squadron (February 23).

No. 932 (HAMPSHIRE) (BALLOON) SQUADRON.—Maj. H. C. Covell, T.D. (T.A.R.O.), is granted a commission as Flight Lieutenant (February 13).

No. 939 (WEST RIDING) (BALLOON) SQUADRON.—Capt. R. Caley, M.C., is granted a commission as Squadron Leader and appointed to the command of the squadron (March 8).

No. 942 (EAST RIDING) (BALLOON) SQUADRON.—G. V. Wright is granted a commission as Acting Pilot Officer (February 28).

No. 943 (EAST RIDING) (BALLOON) SQUADRON.—The following are granted commissions as Acting Pilot Officers on the dates stated:—T. J. Davies (February 27); S. L. Kilburn (March 4).

TOWARDS 100 per Cent. REGULARITY

Some Suggested Equipment and Methods for Airline Operation in Poor Visibility

By FRANK BRENT

OUR contributor is a commercial pilot of considerable experience. He has for some time been flying on Wrightways' London-Paris freight services, the schedule of which is such that much bad visibility—particularly early morning fog—is encountered, and opportunity for practical experiment is plentiful. He has expressed to us great appreciation of his company's willingness not only to provide its pilots with any available instrument or radio equipment, but to afford ample facilities for practice and experiment—no small matter for an unsubsidised company. Wrightways, incidentally, won last year's G.A.P.A.N. Reliability Trophy for regular commercial operation.

IT is an accepted fact that regular airline operation in Europe necessitates a great deal of flying in conditions of very bad visibility, and to this end a ground organisation of considerable complexity has been built up. Whilst this is still capable of improvement, it is now possible, provided that suitable machines fitted with the necessary equipment are used, to operate regularly in the daytime in visibility down to something of the order of 200-300 metres for landings and very much less for departures. It must be conceded that this is no mean achievement when the working speeds are considered.

Departures in almost zero visibility are possible and practicable, but completely blind landings will probably remain in the experimental stage for some time yet—until, in fact, machines with very much lower landing speeds are in use. At the moment, therefore, it will be more profitable to concentrate efforts on improving available methods and equipment to secure easier and more reliable operation up to, but not beyond, the present possible standards of minimum working visibilities. To this end a detailed survey of current piloting practice, together with a few suggestions regarding equipment, should prove of value. No claim is made that any system or method described is the only one that can be used, since it must clearly be recognised that flying, as a science, is developing very rapidly indeed—much more so than was the case, for example, with marine transport—and the need for an open mind towards all its aspects is all-important.

For all-weather airline operation, and to secure the maximum benefit from the ground organisation provided, there are certain aircraft and equipment requirements which must be met, and the time is long overdue for an abandonment of the attitude only too common in this country on the part of both builders and operators that as long as an aeroplane can be flown from A to B and is fitted with the barest minimum of radio and instrument equipment all is well.

The aircraft should be easy to fly with no more than normal physical effort, be stable about all axes, particularly fore and aft, and should not be subject to large change of trim with varying amounts of throttle. As low a landing speed as possible is desirable, and any flaps fitted to attain this should be arranged so that they can be fully applied during the last stages of a blind approach without adversely affecting the subsequent take-off and climb characteristics should a landing not be made. If the use of full flaps prevents the attainment of maximum climb, unless they can be instantly withdrawn without loss of lift (this is possible only with purely air-brake flaps) in the event of an unsuccessful approach, the anomalous position arises in which, because the pilot dare not use full flaps during a blind approach in case he has to go round again, the aeroplane has for all practical purposes a higher landing speed in fog than in clear.

With flaps applied, undercarriage down, and airscrews in fine pitch, the aeroplane should have its normal flying characteristics so far as these can be attained in that condition, and should be completely controllable with control column, rudder and throttles only. Means should be provided to give the pilot at least some measure of direct, draughtless forward vision—not through glass. The importance of quick, easy and certain communication between the members of the crew cannot be overestimated; and for this reason the cockpit should be soundproofed so that normal speech can be heard (incidentally, this would go a long way towards eliminating "noise fatigue"). The radio operator is best seated beside the pilot in one-pilot machines and behind the co-pilot, on the same level, in two-pilot machines.

Complete duplicate flying instruments should be fitted in two-pilot aircraft, and in any case there should be two directional gyros and two sensitive altimeters. The "standard altimeter" found on British machines is just so much junk and can be omitted. These instruments,

The author advocates convenient placing of the radio operator in relation to the pilots. As yet, unfortunately, ordinary airline equipment does not permit such palatial control quarters as those found in the vast Boeing 314 flying boat. Here there are a navigator, two pilots, radio operator and flight engineer, each with his own conveniently arranged sphere of operations.

together with certain radio indicator dials, should be mounted in a standard manner, that suggested being in two rows thus (reading from left to right): top row—A.S.I., artificial horizon, rate-of-climb indicator, V.H.F. beacon receiver course and glide-path indicator, flap and undercarriage position indicator, A.S.I., artificial horizon, rate-of-climb indicator. Bottom row: Sensitive altimeter, directional gyro., turn-and-bank indicator, radio compass (or visual indicator for D/F receiver), absolute atmospheric pressure meter, sensitive altimeter, directional gyro, turn-and-bank indicator. The compass position is best chosen for freedom from local magnetic and electrical influence, but should be such that comparison with the directional gyros is easy. If an automatic pilot (desirable in aircraft large enough to warrant it) is fitted, it is best placed centrally.

Wireless Demands

The radio installation must be regarded as an integral part of the aircraft, and not as a necessary evil to be tucked away in any odd corner that can be found for it. The use of R/T should not be countenanced, as it has no real advantages. It can, in certain circumstances be worked by a solo pilot himself, but because such a pilot has quite enough to do in thick weather without working two-way radio, this practice should never be adopted. R/T is, of course, entirely out of the question for international flying because of the language difficulty. It is in almost all cases slower and less positive than W/T, and is also technically undesirable in Europe (where there is such a shortage of frequencies) by reason of the frequency spread associated with a modulated carrier.

In addition to the usual two-way W/T equipment, there should be installed:—

(a) A simple emergency transmitter with a range of at least 50 miles, so arranged that it is entirely independent of the main transmitter as regards current supply, etc.

(b) A medium-wave straight and D/F receiver entirely independent of the main receiver, and fitted with an enclosed D/F loop. The D/F readings should be obtained on a verge ring which can be set to the course steered, and the visual indicator (which appears to be the most satisfactory means of showing both "sense" and minimum) must be mounted close to one of the directional gyros to facilitate accurate checking of the course at the instant of taking the bearing. This receiver and the loop gear must be within reach and workable by the pilot, so that he, or the second pilot-navigator, can use it on the various medium-wave navigation beacons, broadcast stations, and medium-wave approach beacons which are available. It is not generally appreciated that D/F on board the aircraft is only practically possible in bad weather if such a separate receiver is fitted in this way, for the radio operator must keep continuous watch on the two-way communication frequency to avoid the possibility of missing vital messages. The D/F loop should be carefully swung in flight taking at least three readings at about every 20 degrees round the scale, and making correction curves for all frequencies used (generally a single curve will serve over a range of about 300 or 400 kcs, but this will vary in individual cases).

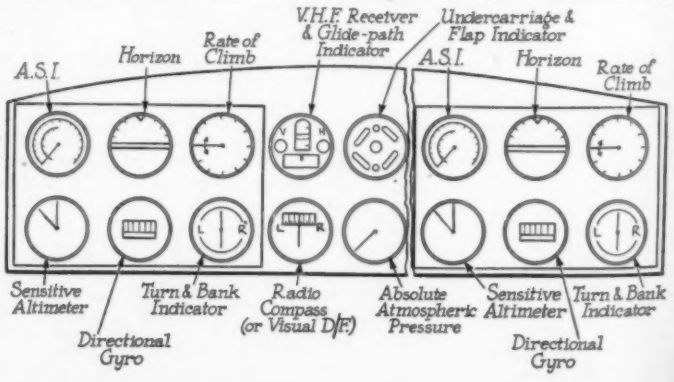
(c) A V.H.F. approach beacon receiver capable of adjustment to cover the frequencies of all beacons which may be used.

With this equipment provision is made for most eventualities, including transmitter or receiver failure—this being essential when it is considered that an aircraft in fog is helpless without two-way radio communication and is a menace to all other machines in the air within a large radius—and in nearly all cases the whole of the radio navigation can be done without burdening the already overloaded communication frequencies with position-finding signals.

There are always new instruments of one kind and another becoming available—e.g., the new R.C.A. radio-compass and the radio "terrain clearance meter"—but these are not yet available here, and the suggestions made are framed with consideration as to what equipment is actually available for use in this country.

The three phases of a flight in foggy weather—of course, there may not be fog over the entire route in all cases—departure, journey and arrival, can be considered separately.

The extreme case of the take-off is in what is loosely called zero visibility, but this really means in a visibility of not less than 10 metres or so, for it must be possible to see to move about on the ground. It is essential that the pilot be absolutely familiar with all the characteristics of the intended take-off by having made it many times in clear weather in similar circumstances as regards the aircraft and its loading, the direction, and the position of obstructions. In addition to the routine checking of controls, motors, fuel system, instruments and radio—assumed to be adequate in any case—a further extra check is needed on the functioning of the directional gyros because of the trust that is placed in them. After setting



A rough sketch indicating the duplication of blind flying instruments and the simplication of other instruments as advocated by Mr. Brent. The instrument panel is "broken" to indicate the absence of a section which might be devoted to engine instruments and other minor necessities not strictly coming under the heading of flying instruments

them to the heading of the aircraft the machine should be taxied round through at least 360 degrees, the compass allowed ample time to settle, and the readings again compared.

Except with a very stable aeroplane on a large, smooth aerodrome with which the pilot is very familiar, the use of a fogline is essential, if only to give positive directional guidance up to the point of leaving the ground. Many aircraft have to be "flown off," and, as actual sight of the ground is then needed, fogline guidance cannot be dispensed with. If a fogline is not used the point and direction of departure must be known and verified beyond all possible doubt, but it is felt that because of the disastrous results likely from an error in this matter it is not really desirable to take off thus on any scheduled service.

There is hardly ever any wind in dense fog, and the take-off is normally best made in the reverse blind-approach direction, this being the most obstruction-free. Needless to say the maximum run available is taken—it is often not easy even to find the fogline, let alone the usable end of it—and this is one of the points calling for familiarity with the aerodrome. If an approach beacon is available it can be of assistance as a check on the maintenance of the desired track after the take-off, and in this case the appropriate fogline, should there be more than one, is used. In using an approach beacon thus the receiver A.V.C. should be in circuit, so that the signal strength is kept constant within the limits of the receiver, for at the outset the aircraft will be very close to the beacon transmitter. The compass verge ring is best set to the take-off heading, and, for convenience, the directional gyros at "O" on that heading. The take-off is effected by sight up to the point of becoming air-borne and then continued on the instruments. Should sight of the fogline be lost before leaving the ground it is highly advisable to stop and return to the beginning again, for a swinging take-off may be difficult to correct on instruments, and can easily become dangerous.

Self-contained Navigation

Undercarriage retraction is effected as soon as the machine is air-borne, and as usual every effort made to attain minimum "one engine" flying speed as soon as is possible, but the minimum safe heights at various distances out on the departure track must be borne in mind, and here the approach markers are of service in accurately indicating points on this track. It is obvious that great trust has to be placed in the sensitive altimeter, and the desirability of the provision of two of these, as mentioned above, is again stressed. After reaching the minimum speed referred to, the aircraft can be put into its normal climb and the usual adjustments to airscrews, flaps, throttles, etc., made.

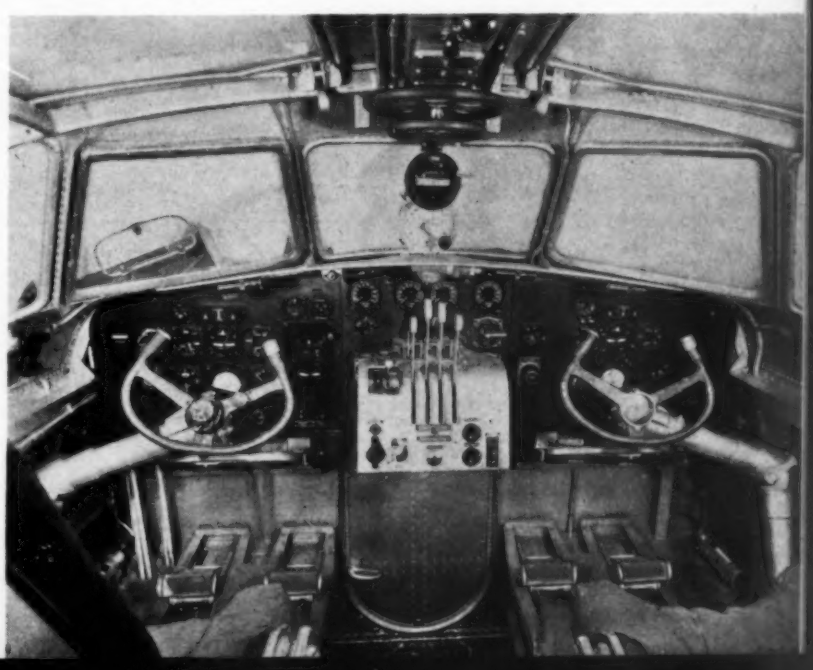
Given adequate equipment, and provided the pilot has the necessary skill and quickness on the up-take, the above procedure appears to make use of all available safeguards, to take care of all eventualities, and to be possible in regular scheduled operation. It is applicable to all cases when visibility is not as short as the minimum quoted, and greater visibility will naturally make things much easier.

During foggy weather the actual journey will probably be made at least partly out of sight of the ground, and because of the radio congestion, which (whilst always existent in clear weather, by reason, amongst other things, of the shortage of frequencies for two-way communication) is greatly increased in bad weather, it is much more necessary for the aircraft's crew to be able to do their own radio navigation. This ability is, of course, a great advantage at all times with the logical "above the overcast" flying on long-distance services.

The radio equipment described will enable this to be done as far as is possible, and two-way communication can be reduced to the very minimum. As the loop is a very simple type of D/F aerial, it must be borne in mind that extreme accuracy cannot be expected, and in good conditions errors of plus or minus 3 degrees are usual, whilst when night effect is present errors of large, unknown amount may occur. Selection of transmitters on which to take bearings must therefore be made with this in mind, and stations over 80 or 100 miles away should not be used unless no others are available. It is also found that transmissions of frequencies higher than about 800 kc/s or so will not generally give reliable bearings.

Arrivals in foggy weather, and at other times when fog regulations are in force, are almost always effected by some sort of "zone procedure." When traffic is heavy it assists smooth working if, as soon as an aircraft arrives in the radio area of its destination, the fullest information is given in one comprehensive signal to the Ground Control as to height, speed, E.T.A., and intentions, and if Control can then allot a turn for landing and specify a time (as soon as possible after the given E.T.A.) at which the aircraft should arrive, the pilot can usually take steps to avoid having to wait his actual turn to land close to his destination in proximity to other waiting aircraft with earlier turns. Some form of "flight plan" system would be a great benefit, but, whilst such a thing is comparatively easy to arrange on a national basis, as, for example, in the U.S.A., its application internationally is by no means simple. One of the great difficulties found by pilots, particularly with fast aircraft, is that of keeping just outside an approach zone at a known position whilst awaiting their turn to land. It would perhaps be possible to make use of track beacons and markers, either medium or high-frequency, to mark zone boundaries and definite positions for waiting aircraft. Certainly the available ground D/F organisation, in this country at any rate, cannot cope satisfactorily with several fast machines at the same time. With the radio equipment as suggested on the aircraft, however, the best use of existing facilities can be made. For instance, at Croydon, by using the D/F set on London Regional transmitter (Brookmans Park) and the high-frequency beacon receiver simultaneously on the Lorenz beacon, station can be kept at a convenient position on the approach beacon axis. It is, of course, advisable to sit on an approach beacon axis only if Control has given a free height at which to do so, or if one is flying clear.

Speed and ease of operation being so important, the great advantage of this use of track beacons and markers is that the information they give can be instantly available direct to the pilot with the minimum of effort on his part. However, if sufficient thought be given to the use of such equipment as can be installed, it is possible in many cases to cope fairly well with this aspect of the problem. The weak link in the chain is the one machine flying in fog with



An example of duplicated instrument-flying panels—interesting because it is the control cabin of the Dornier Do.24 four-engined transatlantic flying boat. Notice the two distant-reading compass dials at the top of the panels.

the barest minimum of equipment and (as is so often found with such aircraft) an irresponsible pilot of mediocre ability. This is a combination which can be a menace to all other aircraft flying at the same time, and which is at all times a source of delay and consequent expense to other operators, no matter how well equipped their machines may be, or how careful and conscientious their pilots. It is felt that, whilst much has been done to provide facilities for landing in fog, insufficient attention has been paid to the problem of handling waiting aircraft, and, in the writer's opinion, the greatest danger in foggy weather is that of collision between approaching machines.

There are a few items which require attention as a preliminary to the final approach. The directional gyros must be kept constantly checked for heading, and care should be taken that the compass has really settled down before making any alteration to them—this is a point often unsuspectingly overlooked. It is a good thing to keep a continuous record of the rate of wander of the gyros during the journey, for after the approach has begun it is inadvisable to make any further alterations to their settings (in spite of advice given in books on how to fly) and a knowledge of what error is to be expected is helpful. It is often possible to wait a turn to land above cloud in clear air and, what is more important, smooth air. In such cases the descent should be so arranged that passengers are not upset by sudden increase of pressure, and generally a rate of descent of 100 metres a second is high enough. If the air is very rough at lower heights, it may, however, have to be considered whether it is preferable to descend more quickly and shorten the time to be spent in the bumps, although this may mean stuffed-up ears for those unfamiliar with the swallowing remedy.

When turn No. 2 has been received, it is time to ask for the latest visibility ceiling and pressure at the aerodrome if these have not been received within the last 15 minutes, and to set the sensitive altimeters to the QFE. At some aerodromes there is a prearranged system of height zoning for waiting aircraft—No. 1 flies at 400 metres, No. 2 at 700, No. 3 at 1,000, and so on (the actual heights are, of course, arbitrary), and at others height zoning is done to suit the needs of the moment. There is an unfortunate inclination on the part of some Ground Controls to assume that all is well as long as only one machine is in the control zone at a time, and all the assistance that other machines can get is to be told to "stay outside." Improvement in this matter so as to avoid the risk of waiting aircraft colliding with each other or obstructing the machine actually approaching to land would appear to be best achieved by pilots insisting on definite information and instructions.

In this country there is often unsatisfactory working, and, not infrequently, actual danger, because of the fact that the Controls have no authority to issue instructions to any aircraft, but can give advice only; and there have been many instances of near collisions because certain pilots have thought fit to disregard such advice. Of course, whether control officers would be found willing to assume the responsibility of giving definite instructions for the pittance of a salary they receive is another matter, but it is certain that unless action in this matter is taken by the authorities, there will sooner or later be a grisly accident through some moron of a pilot disregarding advice from the ground and trusting once too often to the size of the sky to enable him to miss other machines.

(To be concluded next week, when Mr. Brent will discuss in detail the technique of beacon approaches and landings).

GARDEN PARTY MILITANT

DEMONSTRATIONS by flights of Hurricanes and Blenheims, arranged by the Air Ministry, will be an outstanding feature of this year's Garden Party of the Royal Aeronautical Society, to be held at Fairey's Great West Aerodrome, near Hayes, Middlesex, on Sunday, May 14. Another Service contribution will be aerobatics by Sqn. Ldr. Donaldson.

Among the aircraft which, it is hoped, will be shown or demonstrated by their manufacturers are: Boulton Paul Defiant; Blackburn Skua; Hawker Hurricane; Westland Lysander II; Miles Master; D.H. Moth Minor; C.40 Autogiro; a new Arpin, Chilton; Wicko; General Aircraft pressure-cabin machine and the tricycle Cygnet; Luto Major and Buzzard; Moss Pobjoy Sports and Cirrus Trainer; Percival Q.6, Vega and Mew Gull; and Willoughby Delta. Airline companies will contribute a D.H. Albatross, Lockheed 14, Douglas D.C.3 and Bloch 220. Messrs. R. G. J. Nash and R. O. Shuttleworth will again produce historical types, their flying of which was such a popular feature of last year's party.

Again this year there will be a "static show" of accessories and equipment.

Tickets (5s., including tea), can be obtained through members of the society.

CO-OPERATION AT TORQUAY

ABOUT 250 members of the Exeter and the Plymouth and District Aero Clubs and their friends attended the ball at the Grand Hotel, Torquay, on April 14, which was jointly organised by both clubs. It was a great success and provided a much-needed opportunity for the members of these two clubs to meet and exchange news and views. The guests included the Mayor and Mayoress of Torquay (Mr. and Mrs. C. G. Price), Sir Arthur and Lady Hollely, Mrs. F. G. Miles (Civil Air Guard Commissioner), and Mr. Whitney Straight and his wife, Lady Daphne. The dance was preceded by an informal supper.

The Mayor of Torquay expressed regret that his town could not boast of a similar club, and drew attention to the valuable work of the Exeter and Plymouth clubs in training pilots. These two cities, he said, owed a debt to Mr. Whitney Straight.

Mr. Straight, replying, outlined the rapid recent growth of the two clubs, and reminded his hearers of the individual who had established the basis from which they had grown, and whose constant endeavour had helped to bring them up. He was speaking of Mr. W. R. Parkhouse—founder of Haldon and present manager of Exeter. He expressed his appreciation of the fact that Mrs. Miles had come from London to attend the dance, and referred to her work as a C.A.G. Commissioner.

Mrs. Miles said that she had not been to the Exeter or Plymouth clubs before because the reports which she had received from them were first-rate. Those reports compared very favourably with other clubs, and she had postponed her visits until the summer. Other speakers were Sir Arthur Hollely, Mr. C. R. Browne, a member of Exeter City Council, and the two airport managers.

Forthcoming Events

MAY.

Thurs.,	4th.	R.Ae.S. Lecture*: "Strength of Thin Metal Construction," by H. L. Cox.
Fri.,	5th.	Official opening of Guernsey Airport by Sir Kingsley Wood.
Sun.,	14th.	R.Ae.S. Garden Party, Faireys' Great West Aerodrome.
Mon.,	15th.	"The High Ball"—Air League Dinner and Dance, Grosvenor House, London.
Tues.,	16th.	Aero Golfing Society: "Flight" Trophy, Wentworth.
Sat.,	20th.	Empire Air Day.
Thurs.,	25th.	R.Ae.S. Wilbur Wright Memorial Lecture by Dr. G. W. Lewis.
Sat.,	27th.	London-I.O.M. Race.
Mon.,	29th.	Manx Air Derby and Tynwald Race.

JUNE.

Sat.,	10th.	Brooklands Flying Club "At Home."
Sat.,	17th.	Official opening of Derby Municipal Airport (Burnaston) by Sir Kingsley Wood.
Wed.,	21st.	Aero Golfing Society: Jubilee Cup, Berkshire Golf Club.
Sat.,	24th.	Royal Air Force Garden Party.

JULY.

Sat.,	8th.	Official Opening of Birmingham Airport (Elmdon) by H.R.H. the Duchess of Kent.
Sat.,	8th-Sun., 16th.	National Gliding Contests, Great Hucklow.

* This lecture takes place at 6.30 p.m. at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

THE ROYAL AERO CLUB

News and Official Notices for the Week Ended April 22

Wakefield Challenge Trophy Race

THE scope of the Wakefield Challenge Trophy Race, which is to be flown concurrently with the King's Cup Air Race at Birmingham on September 2, will be greatly increased if the requirements are altered in accordance with suggestions made to the Royal Aero Club. At present every aeroplane competing would be required to have a Certificate of Airworthiness, but the Royal Aero Club Committee is to consider relaxing this rule and allowing aircraft accorded a special "permit to fly" by the Air Ministry to take part.

This proposed change would enable all the new machines now being built for Civil Air Guard training purposes to take part. They include novel and interesting types, some of them fitted with tricycle undercarriage and others with pusher engine arrangements. It is highly probable that The Committee will agree to this step.

Cadet Camps

AN example to all civil undertakings dealing with national preparedness was set last week by the London Gliding Club. In order to enable the scheme for instructing Air Defence Cadets at camps in various parts of the country to start at once, living quarters were erected at Dunstable in the record time of four days. As a result the first course of 40 Cadets was actually started during the week-end. It will be followed by five other similar 14-day courses, each course numbering 40 boys. Other clubs of the British Gliding Association will arrange their Cadet training in June, July and August.

Although the gliding clubs are undertaking to train Cadets, all matters of sleeping and victualling are under the control of the Air League of the British Empire. The building put up by the London Gliding Club was a special arrangement taken on behalf of the Air Defence Cadet Corps. Normally, the Air League proposes to put the boys under canvas.

Reports from Dunstable indicate that the boys comprising the first course are showing tremendous enthusiasm, and it is thought that this form of holiday will make a strong appeal to all Cadets and will lead to a good deal of friendly rivalry among them for selection.

Muscadet Meeting

AN air rally in which the important prizes consist of casks and cases of the famous Muscadet wines of the Nantes region has been arranged for May 6 by the Aero Club de l'Atlantique at the aerodrome of Chateau-Bougon at Nantes. The first prize includes, in addition to 1,000 francs in cash, half a hogshead of Muscadet. The second prize is 500 francs and 30 bottles. Free accommodation is offered to competitors who comply with the conditions of the Rally. Those wishing to take part should apply to the Secretary of the Royal Aero Club.

On the Air Routes

FRANCE.—Balloon ascents will take place near *Chartres* aerodrome between April 22 and May 6, and near *Braqueville* (south of Toulouse) between April 24-28.

Saumur St. Florent Aerodrome has been closed to civil air traffic.

GERMANY.—Pilots are reminded that hangar accommodation is limited at certain German aerodromes. Picketing gear should be carried.

HUNGARY.—The temporary prohibited areas of which details were given in these notes of April 8 have been abolished.

SWITZERLAND.—Between April 25 and May 11, excepting Sundays, A.A. firing practice with live ammunition will be carried out from 0900 to 1600 hours on the range between *Zuoz* and *Scanfs* in the canton of *Grisons*. Civil aircraft should avoid the danger zone which lies within: *Ponte-Piz Kesch - Piz Ravigliel - Ducan glacier - Sattelhorn - Piz Vadret - Cinuskel-Piz Casanella-Ponte.*

Aviators' Certificates

No.	Name	Club or School	Date
17,654	Douglas Boyd Calderwood ...	Strathtay Aero Club ...	11.4.39
17,655	William McAusland	Scottish Flying Club ...	11.4.39
17,656	David Gardner Weir	Scottish Flying Club ...	10.4.39
17,657	Edward McCulloch	Scottish Flying Club ...	11.4.39
17,658	Albert Percival Snelling	Airwork Flying Club ...	7.4.39
17,659	William Mackie	Airwork Flying Club ...	10.4.39
17,660	Arthur Sewell	Airwork Flying Club ...	9.4.39
17,661	Percy Frederick Collins	London Transport (C.B.) Sports Assn. Flying Club	7.4.39
17,662	Clifford Harold Armour	Romford Flying Club ...	31.3.39
17,663	Charles Victor Brewster	Romford Flying Club ...	8.4.39
17,664	Jack Stuart Simson	Brooklands Flying Club...	31.3.39
17,665	Newsome Henry Clough	Romford Flying Club ...	7.4.39
17,666	Michael Goff	Herts and Essex Aero Club	5.4.39
17,667	Albert Edward Foster	Herts and Essex Aero Club	9.4.39
17,668	Stanley Nelson Goddard	Herts and Essex Aero Club	11.4.39
17,669	Roy Ernest Drawater	Herts and Essex Aero Club	10.4.39
17,670	Marion Mavis Allaun	Cinque Ports Flying Club	5.4.39
17,671	Edward Denis Kearns	Hampshire Aeroplane Club	8.4.39
17,672	Frank Charles Muir	Horton Kirby Flying Club	8.4.39
17,673	Leslie Arthur Reginald Kemp ...	Horton Kirby Flying Club	8.4.39
17,674	Donald Allen Benjamin Statton...	Liverpool and Dist. Ae. C.	24.3.39
17,675	Wilfred James Radcliffe Humerston.	Malling Aero Club ...	12.4.39
17,676	Bernard Cleal Harling	Bournemouth Flying Club	8.4.39
17,677	Cecil Henry Swyers	Bournemouth Flying Club	8.4.39
17,678	Robin Leslie Hutchins	Bournemouth Flying Club	5.4.39
17,679	Arthur Oliver Hawkes	Bournemouth Flying Club	9.4.39
17,680	John Peter Almack	Bournemouth Flying Club	9.4.39
17,681	Stanley Albert Henry Swain ...	Bournemouth Flying Club	8.4.39
17,682	Charles Edgar Moth	Bournemouth Flying Club	6.4.39
17,683	Joseph Lowes Thompson... ...	Bournemouth Flying Club	6.4.39
17,684	John Dodd Richardson	No. 9 E and R.F.T.S., Coventry.	21.3.39
17,685	Victor Thomas Faiers	West Suffolk Aero Club...	8.4.39
17,686	Claude Barrie Bailey-Watson ...	West Suffolk Aero Club...	9.4.39
17,687	Ernest Laurie Gardner	Airwork Flying Club ...	12.4.39
17,688	William Elliot Copley	Doncaster Aero Club ...	11.4.39
17,689	Sidney William Harding	Civil Service Flying Club	16.2.39
17,690	Alexander Kennedy Robinson ...	Civil Service Flying Club	22.2.39
17,691	Kathleen Marjorie Haylock ...	County Flying Club ...	7.4.39
17,692	Leonard Arthur Syer	County Flying Club ...	8.4.39
17,693	Philip Stanley Lester	County Flying Club ...	9.4.39
17,694	Kenneth Herbert Harper... ...	County Flying Club ...	10.4.39
17,695	Albert Edward Henry Cosham ...	London Aeroplane Club...	12.4.39
17,696	Reginald John Richard Jackson...	Cotswold Aero Club ...	13.4.39
17,697	Clifford Pryce Roberts	North of Ireland Aero Club	9.4.39
17,698	David Michael Marquess of Milford Haven.	Portsmouth Aero Club ...	10.4.39
17,699	Thomas Charles Rigler	Bournemouth Flying Club	14.4.39
17,700	Aubrey Wilton Briscoe-Knight...	Hull Aero Club	8.4.39
17,701	Stanley Arthur Tucker	Romford Flying Club ...	10.4.39
17,702	Richard Cooper Greenlees ...	Redhill Flying Club ...	9.4.39
17,703	William Bernard Ellis	Herts and Essex Aero Club	10.4.39
17,704	Aymer Stritch Hutton	Bournemouth Flying Club	11.4.39
17,705	Reginald Ernest Richardson ...	Bournemouth Flying Club	10.4.39
17,706	Michael Keymer	Bournemouth Flying Club	7.4.39
17,707	Ruvi Batra...	Witney and Oxford Ae. C.	15.4.39
17,708	John Stewart Wood	Witney and Oxford Ae. C.	10.4.39
17,709	John Walter Kirtland	Witney and Oxford Ae. C.	2.4.39
17,710	Richard Dewey George	Southend Flying Club ...	16.4.39
17,711	Harry Angus Mackay Pascoe ...	Southend Flying Club ...	9.4.39
17,712	Anthony Charles Henry Reed Russell.	Southend Flying Club ...	16.4.39
17,713	James McIntosh Culley	Airwork Flying Club ...	16.4.39
17,714	Stuart Hagen Lennox	Airwork Flying Club ...	12.4.39
17,715	Maurice Frederick Cleave Harding	Exeter Aero Club ...	28.3.39
17,716	Geoffrey Bowcher Davie	Exeter Aero Club ...	16.4.39
17,717	James Raymond Meek	Tollerton Aero Club ...	14.4.39
17,718	Eric Harrison	Tollerton Aero Club ...	14.4.39
17,719	John Martin David Andrews ...	Cardiff Aeroplane Club ...	12.4.39
17,720	George Eric Holden	Cardiff Aeroplane Club ...	12.4.39
17,721	Clifford Charles Ivor Robert: ...	Cardiff Aeroplane Club ...	9.4.39
17,722	Evan Llewellyn Roberts	Cardiff Aeroplane Club ...	14.4.39
17,723	Frederick Sharp Barraclough ...	Doncaster Aero Club ...	17.4.39
17,724	Clifford Peter William Wa'de ...	Witney and Oxford Ae.C.	16.4.39
17,725	Maurice Ernest Morey	Exeter Aero Club ...	13.4.39
17,726	Michael Gustavus Fowke... ...	Portsmouth Aero Club ...	10.4.39
17,727	George Dill...	County Flying Club ...	16.4.39
17,728	John Foryd Whalley	Worcestershire Flying Club	16.4.39
17,729	Reginald Charles Read	Herts and Essex Aero Club	13.4.39
17,730	Harold Lewis	Newcastle Aero Club ...	13.4.39
17,731	Donald Felix Currie	Exeter Aero Club ...	16.4.39
17,732	Donald Taylor Smith	Insurance Flying Club ...	11.4.39
17,733	Lancelot Horace Battersby ...	London Air Park Club ...	9.4.39
17,734	Peter Gordon Masefield	London Air Park Club ...	18.4.39
17,735	Donovan Blackmore	Exeter Aero Club ...	18.4.39
17,736	Joseph Roger Forsyth	Romford Flying Club ...	18.4.39
17,737	Robert Henry James Mountford...	Horton Kirby Flying Club	14.4.39
17,738	Frederick William Thompson ...	Cinque Ports Flying Club	14.4.39
17,739	Clive William Richardson ...	Hull Aero Club	17.4.39
17,740	Philip Dalton Watson	Yorkshire Aeroplane Club	14.4.39
17,741	Thomas Charles Pugh	Cotswold Aero Club ...	15.4.39
17,742	Reginald Worth	Northern Aviation Club...	10.4.39
17,743	Ronald Fothergill Rowland ...	Yapton Aero Club ...	10.4.39
17,744	John Leslie Holmes	South Staffs Aero Club ...	15.4.39
17,745	James Steele King	Hull Aero Club	10.4.39
17,746	George Eric George	Reading Aero Club ...	29.3.39
17,747	Scott Barton Spencer	Southend Flying Club ...	19.4.39
17,748	Frederick James Robinson ...	Southend Flying Club ...	19.4.39
17,749	Frederick Walter Hill	Southend Flying Club ...	19.4.39
17,750	Robert Arthur Copeland	Southend Flying Club ...	20.4.39
17,751	Wilfred George Frederick Codling	Southend Flying Club ...	16.4.39
17,752	Horace Henry Corps	Yorkshire Aeroplane Club	18.4.39
17,753	Sheila McKay	Yorkshire Aeroplane Club	18.4.39
17,754	Albert Walter Dale	Wiltshire Flying Club ...	19.4.39
17,755	Hubert Sprostou	Lincolnshire Aero Club ...	1.4.39
17,756	Normand Randolph Moody ...	Lincolnshire Aero Club ...	10.4.39
17,757	William John Monk	Redhill Flying Club ...	19.4.39
17,758	Basil Henry England	Yapton Aero Club ...	10.4.39
17,759	Cyril Henry Stephenson	Portsmouth Aero Club ...	19.4.39

COMMERCIAL CONTRASTS

Some Notes on International Progress in Airliner Development

THOUGH the emphasis on speed, which may be considered to have originated in the U.S.A. five or six years ago, is still directing commercial aircraft design, there are noticeable tendencies to accentuate safety, particularly at take-off and landing, and to improve passenger comfort. The commercial aeroplane of to-day demands too much personal skill on the part of its crew and allows too small a margin of error, particularly at the critical periods of take-off and landing. Yet speed, far from being expensive, can on certain routes effect operational economies, as instanced by Imperial Airway's London-Paris "shuttle" service with the new De Havilland Albatrosses; so those who would put the soft pedal on speed in favour of the ultimate in safety must consider speed not only in relation to passenger convenience but as it affects the operators' bank book. There is, one feels, too much agitation for diesel-engined helicopters, or something of the sort, and too little attention to improving the safety of more conventional aircraft and the operational technique.

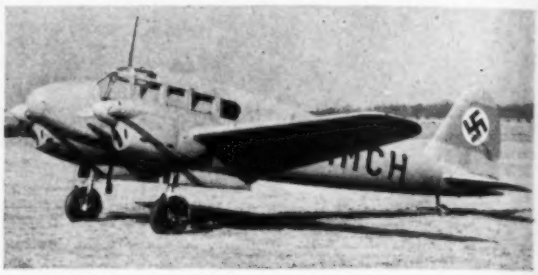
Actually, the picture of commercial aircraft design is not so black as may have been inferred from these first lines, particularly as some of the brains responsible for Britain's peerless military aircraft are now being directed towards civil development. Great Britain, in fact, is entering on a new era of commercial flying. We are out to compete with our rivals on their own terms.

Types Available

The list of our commercial aircraft types is still much too short, though the comparatively few examples we can offer show great individual merit (as witness the review elsewhere in this issue). Their qualities in relation to those of foreign types will be touched on in the ensuing notes.

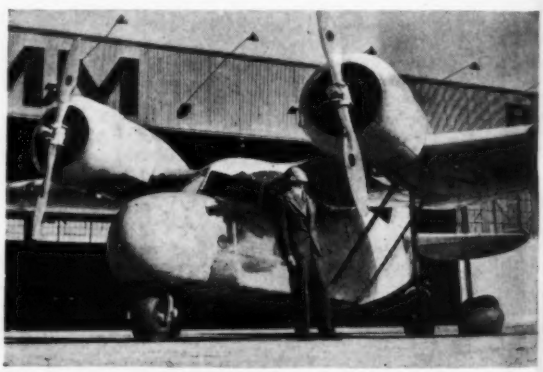
The smallest type of aircraft for which there is a serious demand among commercial operators is the single-engined cabin type seating from three to five persons. This is suitable for special charter work and for newspaper and film assignments. It is exemplified in this country by the single-engined Percival series and in America mainly by somewhat larger types, notably the Beechcraft biplanes and Stinson monoplanes.

The smallest twin-engined commercial model is typically powered with two engines of 130-240 h.p. each.



The smaller twin-engined commercial types are represented by the German Siebel Fh 104 with two Hirth or Argus engines.

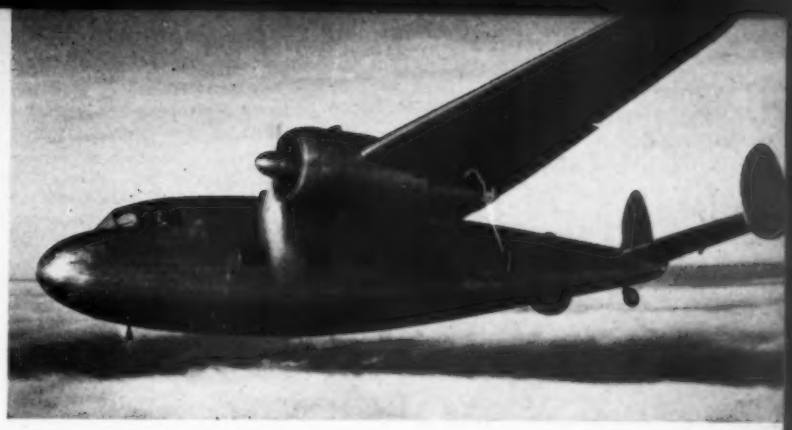
Here, again, Great Britain—with the Percival Q series—can offer something of unusual merit, these machines combining excellent flying qualities with comparative roominess and handsome appearance. Germany has spent a good deal of money developing machines in the same category, though to date the financial returns cannot have been very



The upper machine is the Timm transport (two Wright Whirlwinds), which, like the larger Douglases below it, has a tricycle undercarriage.

The Douglas D.C. 5 (centre) is a new type in competition with the De Havilland Flamingo.

The Douglas D.C. 4 (left) is the largest landplane now flying and incorporates a number of features making for high commercial efficiency.



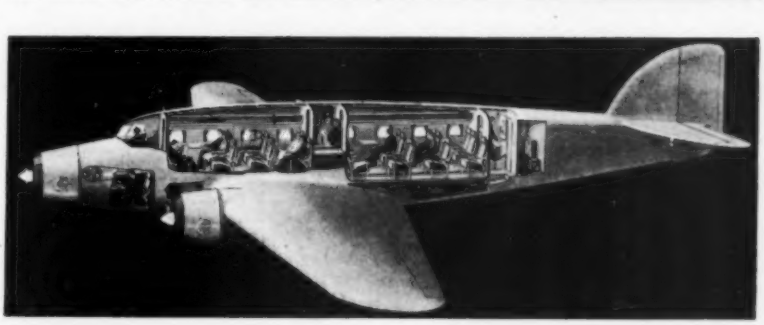
Britain's most recent commercial machine is the De Havilland Flamingo, which has an excellent performance with two Bristol Perseus sleeve-valve engines.

heavy. One type—the Ago Kurier—is of particularly advanced design and has Handley-Page automatic slots. With two 240 h.p. Argus engines a speed of nearly 210 m.p.h. is attainable.

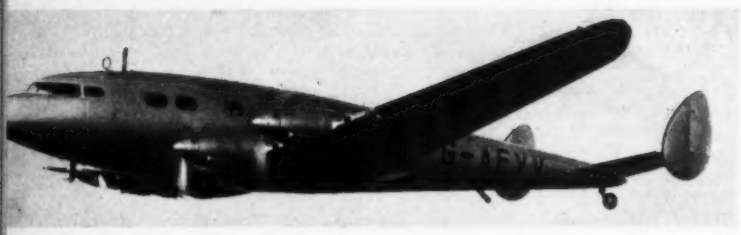
These smaller twin-engined types are not normally employed on scheduled services but rather for charter work, though the evergreen De Havilland 89 (Rapide) has done much to open up new lines in various parts of the world. It is the twin-engined machine of 800 h.p. or more which does the majority of the serious scheduled transport work among the smaller commercial types. This class of aircraft is, perhaps, best exemplified by the Lockheed Electra, which seats up to ten passengers and will cruise at speeds between 170 and 195 m.p.h. on the power of two Pratt and Whitney Wasp Junior engines. More or less to the same formula there has appeared in America the Barkley Grow monoplane and the somewhat smaller and more economical Beechcraft Model 18. Lockheed's themselves have turned out the Model 12 with smaller dimensions and the same power, though this model appeals more to the private pilot, business man or air force than to the commercial operator. The "Tricycle Timm" high-wing type is refreshing.

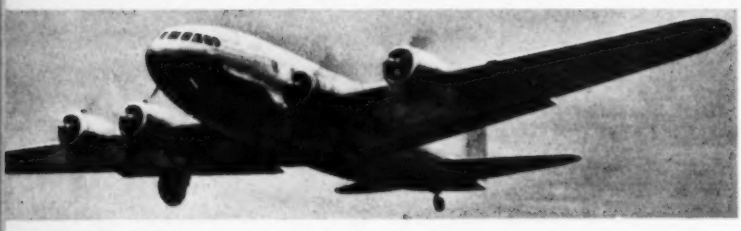
There are few available types between the Electra class and the twin-engined models of 1,400-2,000 h.p., as represented by the De Havilland Flamingo, Douglas D.C.2, 3 and 5, the Lockheed 14, Marcel Bloch 220, Junkers Ju 86 and Fiat G.18 V. Types such as these are bearing the brunt of the work on the major airlines, though in some respects the larger four-engined models are to be favoured. That there is likely to be a demand for the twin-engined commercial machine for some years to come is indicated by the large-scale production in this country of the De Havilland Flamingo, a machine of exceptional merit. Although the Flamingo does not make use of such devices as a tricycle undercarriage or leading edge slots it is of refined design. Two of its big selling points

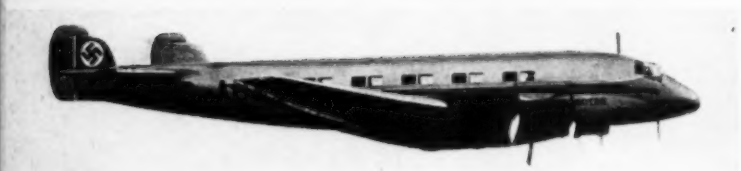
COMING IN: The machines shown about to land with flaps and wheels lowered are, reading across and downward from the left, a Lockheed Electra, Heinkel He 111, Lockheed 14 and Douglas D.C.3. Particularly noteworthy are the Fowler flaps on the Lockheed 14, which has a maximum speed in the neighbourhood of 260 m.p.h. and is fitted with two Wright Cyclone engines.



The layout of the Savoia Marchetti S.M. 75 three-engined machine may be studied on the right. This model has been adopted by a number of airlines.







FOUR-ENGINED FASHIONS: Reading from top to bottom on the left are the Heinkel He 116, which can be used as a passenger machine or long range mail carrier; the De Havilland Albatross and the Focke-Wulf Condor, which are larger machines intended for similar work; the Boeing 307 (Stratoliner); the Junkers Ju 90 and the Armstrong-Whitworth Ensign. Directly above is the Potez 662 which, fitted with four small-diameter Gnome Rhone engines, is probably the fastest transport machine in the world.

are the excellent outlook from a cabin, due to the high monoplane wing, and the use of Bristol Perseus sleeve-valve engines. Douglas has entered the same field with the D.C.5, which is of similar layout but incorporates a tricycle undercarriage upon which feature, incidentally, the manufacturers appear to have standardised. This machine can be fitted with power plants ranging from about 550 h.p. (Pratt and Whitney Wasp) to units giving almost twice this output.

Accentuating speed, the Lockheed 14 is also in competition with the Flamingo. Its performance is due in some measure to the installation of Fowler flaps and to the aerodynamically efficient form of the fuselage and wing. Since the machine has been in service it has been deemed necessary to cut "letter-box" slots in the leading edge of the main plane to improve the characteristics at the lower end of the speed range.

But Lockheeds, too, have felt that there is a demand for a twin-engined machine with a rather lower performance and corresponding with the Flamingo and Douglas D.C. Their new machine, details of which have not yet been released, is to be known as the Lockheed 16.

The Curtiss Wright concern is branching out along somewhat unusual lines in producing the C.W.20, which will be the most powerful twin-engined machine ever built, being fitted with two of the new Wright two-row Cyclones of about 1,500 h.p. each. High-altitude operation is visualised and economy has been studied from many viewpoints.

Tri-motors

The Savoia Marchetti concern in particular has upheld the three-engined formula. Despite the comparative inefficiency of the nose airscrew, Savoia types have proved themselves to be among the fastest weight carriers in the world. France is also obtaining good results from the trimotor Dewoitines on her long-distance services. The brilliant record of the Junkers Ju.52 is by no means completely written.

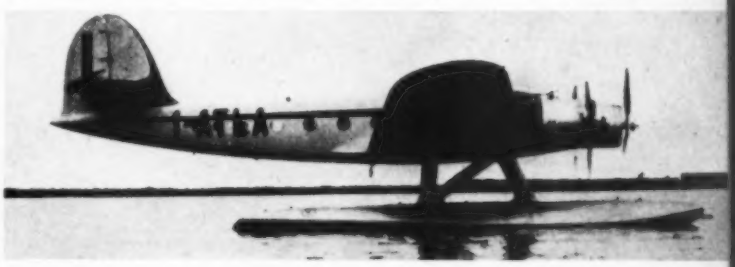
The term "four-engined" usually implies something very big, though the Heinkel He 116 long-range mail carrier has a maximum power (taken from four Hirth inverted vee-eight engines) of only 960 h.p. The Short Scion Senior (four Pobjoys) was, of course, even smaller. It is claimed that with a payload of 1,200 lb. the Heinkel will fly for nearly 2,800 miles. The all-up weight is 15,250 lb. The De Havilland Albatross, too, is of comparatively low power, its four Gipsy Twelve engines delivering about half the power of the units installed in the big forty-seaters. The Albatross, like the Flamingo, must be reckoned an unusually efficient commercial type, thanks to ingenious structural and aerodynamic design and to low cooling drag, which offsets the comparative heaviness of the engines. Such a type, of course, shows up to particular advantage on long-distance services.

A more powerful and larger machine is the German Focke-Wulf Condor, which is quite efficient aerodynamically but exhibits a little unorthodox practice.

The crash of the Boeing so-called Stratoliner must have been a set-back not only to the manufacturers but to the general development of long-distance commercial

Below is a view including the Dornier Do. 24 four-engined long-range flying boat (on the water) and the earlier Do. 18. Under the Dorniers is the Italian trans-Atlantic Cant.

Above is the Biohm and Voss Ha 139 long-distance float-plane, with four Junkers Jumo 205 heavy oil engines.



machines. This was the first aircraft of its size intended for serious commercial operation to embody a pressure cabin for high-altitude operation. Fortunately, the manufacturers have other machines of the type almost completed and the Fairey Company is believed to be well advanced on the F.C.1 commercial monoplanes. The F.C.1 will have four of the new Bristol Taurus sleeve-valve engines, which, like the pressure cabin, will be supercharged for high-altitude flying. Other features of particular interest will be the tricycle undercarriage, special Fairey high-lift devices, and the triple tail. The top speed should be 275 m.p.h. at 15,000ft. Pressure pumps will supply conditioned air to the cabin.

Further experience in the operation of commercial aircraft at high altitudes will be provided by the Short 14/38 landplanes now under construction. These will have four Hercules engines and will be considerably bigger than the Fairey type. The 14/38 will appear in two forms, one of which—the Type B—is estimated to cruise at 275 m.p.h. at 25,000ft. and to be capable of a range of 3,370 miles carrying a useful commercial load. Meanwhile, the largest British four-engined commercial landplane is the Armstrong-Whitworth Ensign, which has been temporarily withdrawn from service for minor structural modifications and the re-rating of its Siddeley Tiger engines at a higher take-off power. There is a great deal to be said for the design of the Ensign. Its passengers have an almost incomparable outlook combined with comfort which is well up to the Imperial Airways standard. Performance, however, is considerably inferior to that of the much more powerful American Douglas D.C.4, with its four Pratt and Whitney Twin Hornet engines of the very latest type, its Hydromatic airscrews and higher wing loading, or with the German Junkers Ju.90. The big Douglas was among the first commercial machines to embody the tricycle undercarriage, and though little has been heard of development work during the past two or three months it is believed that the manufacturers are generally satisfied not only with the landing gear but with the machine in general.

We shall probably see larger landplanes, though most of the projected "super" transports are marine aircraft. Flying boats and seaplanes are already doing magnificent work on the world's airlines and range in size from small single-engined boats or amphibians up to machines of the calibre of the Boeing 314.

Some useful pioneer and regular transport work is being

The commercial version of the Consolidated Model 28 long-range flying boat is exemplified by Richard Archbold's *Guba*. On the right is an artist's impression of an amphibian version of this type which is under development. It will have twin nose wheels.

The most advanced commercial flying-boat in the air to-day is the Boeing 314, the layout which is apparent on the left. The engines are four Wright two-row Cyclones of about 1,500 h.p. each.

done by such types as the Sikorsky S.43 twin-engined amphibian (cruising speed 165 m.p.h.; all-up weight, 19,500 lb.), and the Italian Macchi M.C.94 flying boat.

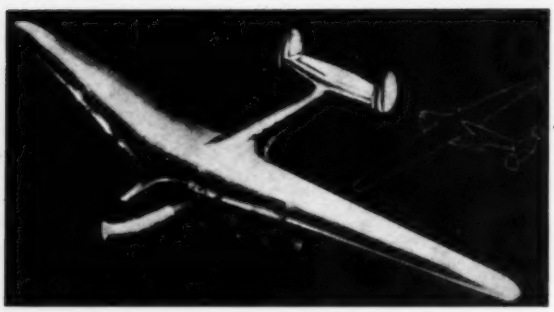
American Export Airlines, which will soon be operating a transatlantic service, are the first commercial concern to take advantage of the civil development of the Consolidated Model 28 long-range twin-engined flying boat which is generally similar to the PBY series used by the U.S. Navy. The version now being offered can carry forty passengers for 600 miles, 30 for 1,300 miles, 24 for 1,750 miles, 20 for 2,100 miles, or 12 (with berths convertible from the twenty-four-passenger arrangement) for 2,500 miles. An amphibian undercarriage now being developed will increase the field of usefulness for this boat, though naturally the payload or range will suffer.

Italy favours the Cant trimotor floatplanes for much of her overwater work, and has, in fact, selected a machine of this type for transatlantic operation. One strong point of the floatplane is that replacement of the floats will permit the machine to be returned to service after an overhaul in shorter time than a corresponding flying boat.

With our fleet of Short Empire flying boats we have proved that Great Britain is unexcelled in the design of large marine craft. Even taking the original performance figures of the standard machine and reckoning by modern standards the Empire boat is still in the front rank. Structural strengthening to permit carrying greater commercial loads, with the assistance of aerial refuelling, puts these boats even farther ahead. They are unquestionably superior, for example, to the newest types of French flying boat with liquid-cooled engine, and it is not surprising that the basic layout adopted for the Empire flying boat will characterise the new G Class, which will have four Hercules engines of about 1,375 h.p. each in place of the Pegasus or Perseus of the smaller machines.

(Right) An artist's "preview" of the interior of a projected Sikorsky designed to carry a hundred passengers.

(Below) This projected Consolidated machine has four liquid-cooled engines of over 2,000 h.p. each, buried in the wing. They drive airscrews through extension shafts and may be attended in flight.



The G Class Short boat will have an all-up weight of 72,000 lb., and is thus considerably smaller than the Boeing 314, which weighs over 80,000 lb., and is fitted with Wright two-row Cyclone engines of approximately 1,500 h.p. each. The Boeing marks a return to Sponson or "seawing" arrangement to give lateral stability on the water. This feature has the incidental commercial advantage that it facilitates embarkation and disembarkation of passengers.

As for projected flying boats, their layout has so far been suggested mainly in drawings accompanying specifications for Pan-American Airways, though Mr. Gouge has estimated figures for machines much larger than the G-class boats.

H. F. K.

Scottish Components Company Registered

THE new company formed to manufacture aircraft components in Scotland has now been registered under the title of Scottish Aircraft Components, Ltd., with capital of £10,000.

First directors of the company are Sir James Lithgow, Bt., chairman; Sir A. Steven Bilsland, Bt.; Mr. John Craig; Mr. Norman W. Duthie, C.A.; Mr. J. Douglas Latta; Dr. A. McCance; and Mr. Alexander Williamson. Mr. L. L. Maitland has been appointed general manager and has taken up duties at the company's offices in Glasgow.

"The High Ball"

AIR COMDRE. CHAMIER is anxious to make the Air League's annual dinner and dance, to be held at Grosvenor House, London, on May 15, "a happy party and not just another charity appeal." There will be no auctioneering or other money-making devices.

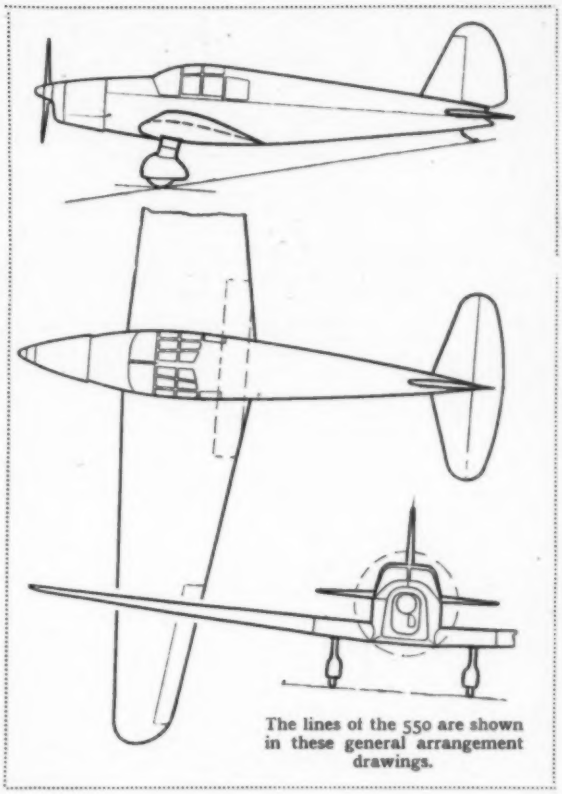
Tickets (from the Air League of the British Empire, Maxwell House, Arundel Street, London, W.C.2) are 27s. 6d. a head (25s. for parties of six or more), excluding wine but including dinner, dance, cabaret, soft drinks throughout the evening, and breakfast between 1 and 2 a.m.

LOW-POWERED PERFORMANCE

Features of the Bibi 550 : Side-by-side Cabin Flying at 120 m.p.h. on 60 h.p.

GENUINE and saleable low-powered aeroplanes have been out and about for the last thirteen years or more, so it is not surprising that we should now have reached the stage when a maximum speed of 120 m.p.h. should be obtainable with side-by-side cabin seating on little more than 60 h.p. The old original Moth, after all, had a maximum of 90 m.p.h. on much the same power, and this worthy machine, though a tandem-seater, was a somewhat adequately bestrutted and braced biplane. Curiously enough, the price in England of the Benes Mraz Bibi 550 monoplane is almost exactly the same as that of the original Moth. So, in spite of the moanings of the pessimists, "popular aviation" has advanced a little way. The landing speed figures of these time-dimension-distant machines are practically the same, so the additional performance in the case of the Bibi has not been obtained by the simple expedient of moving the entire speed-range up through a couple of A.S.I. markings.

This erstwhile Czech machine (the new international situation is not, apparently, likely to interfere with normal deliveries from Prague) is being sold over here by Aircraft and Allied Enterprises. They propose, if they can get their new aerodrome and club plans past the C.A.G. Commissioners and the Council of Associated Light Aeroplane clubs, to use the machine for *ab initio* training. Whether or not it is suitable for such specialised and strenuous work remains to be seen, but as a private owner's or amateur's aeroplane it has a number of really good points.



The lines of the 550 are shown in these general arrangement drawings.

Easy Ingress

Apart from the performance—and the machine genuinely cruises at 105 m.p.h. or more at rather less than the normal revolutions—the side-by-side seater cabin is amply roomy for two large people, and can be entered with, for the type of machine, outstanding ease, through a door on either side; there is plenty of room on a full-width tray behind the seats for luggage of any normal dimensions. The Bibi's characteristics in the air are very good indeed, with light, well-proportioned and really effective controls, and the cruising consumption of fuel should be rather less than three gallons an hour. Furthermore, the machine is sold with very reasonably full equipment. This equipment includes wheel brakes, a vertical-reading compass, and a built-in fire extinguisher.

For the available power, the take-off, even with two people and luggage aboard, is very good indeed, though the machine which I flew had an airscrew which was, if anything, on the coarse side. The initial climb is in the region of 600 ft./min., or a little less. In smooth air it is almost entirely stable and can be flown for quite extended periods hands and feet off. As usual, none but short course-correction turns can be made on the rudder alone, but the machine can be flown indefinitely on the ailerons. Although split flaps are fitted, these are not of very adequate area and the approach is still somewhat flat and, consequently, a little difficult to judge. Minor height adjustments can be made by means of crab sideslip, though in anything resembling a steep slip the speed cannot be kept down to a reasonable figure by means of top rudder.

The flaps are directly operated from a three-position lever on the pilot's left, and the "half" and "full" flap positions can safely be used to stretch the glide or otherwise, since, when the flaps are raised to the "half" position, there is no marked decrease in lift. The effect of lowering the flaps is to make the machine slightly tail heavy and it is necessary to use a touch of trimming control movement. This trimming lever is conveniently placed and the range of the tab movement is covered in a short and more or less identical angular displacement of the control. In the ordinary way this hardly requires to be touched except when settling down to cruising attitude.

For instructional work one would say that both the elevator and the rudder controls are over-light and sensitive at low speeds, and that it is too easy to over-correct during the last phase of the approach. The necessity for accurate fore-and-aft control while holding off, is, however, compensated for by the fact that more or less any kind of landing at any speed below 50 m.p.h. is safe and final, provided that the control is not pulled sharply back. If it is held more or less neutral when making a level "wheeler," the machine will stay comfortably on the ground. At the full control position there is just enough elevator and not too much for a good three-pointer—which is as it should be.

Knowing nothing of its test history, I did not attempt any stalling experiments to the extent of precipitating a possible spin. A gentle stall,

Cleanly conventional in the modern manner, the Bibi has no unnecessary protuberances — hence the performance.

however, is harmless enough and aileron control remains to the last. Only when the nose is pulled up quickly does a wing drop, and then the machine certainly feels as though it might start a quick spin if permitted to do so. Given normal handling there is little wrong with the characteristics at the stall, though this arrives somewhat sooner (at 45-50 m.p.h.) and more noticeably with the flaps up.

The performance has, to some extent, been obtained at the price of poor forward visibility. Even when flying level the nose is only a little way below the horizon and the screen is so flatly curved that some distortion is inevitable. On the ground it is not possible to see anything ahead without gymnastics or the help of an intelligent and wide-awake passenger. This is a fault which may be serious where instruction is concerned.

On the Ground

Another trouble is that the tail appears to be over-light on the ground, so that the brakes cannot be used for stopping purposes unless there is luggage in the locker—and must be used with care when manœuvring. While taxying down-wind in anything more than a light breeze, the elevator control has to be held neutral or, alternatively, moved in conjunction with the throttle—back when motoring and forward when throttled back. Except for the fact that the simple ratchet pull-on brake lever would not stay in the "on" position, I had no trouble on the ground, and it is possible that the danger of nosing over has been exaggerated. Later models will be heavier in the tail and this should remove the necessity for care.

Figures for the Bibi 550 are: Span, 37ft. 8in.; length, 23ft. 7in.; weight empty, 753 lb.; all-up weight, 1,234 lb.; maximum speed, 120 m.p.h.; cruising speed, 105 m.p.h.; landing speed (flaps down), 36 m.p.h.; climb to 3,000ft., 6 min. 50 secs.; service ceiling, 13,000ft.; cruising range 480 miles; price (in London), £750. Concessionaires: Aircraft and Allied Enterprises, Ltd., 87, Regent Street, London, W.1.

H. A. T.

"Flight" photographs.

Inside the two-seater cabin. Notice the door entry width and height, and the quaint but practical control column arrangement. The throttles work downwards to open and a built-in fire extinguisher (right) is fitted as standard.

Travelling Instruction

IN order to give flying instruction in various parts of Southern Rhodesia a new scheme, known as the Travelling Flying School, was started in October last year, the first point of call being Que Que. At present the itinerant school consists of a slotted Tiger Moth, a tent, a box of tools and spares, and half a dozen helmets, earphones and goggles—with, of course, an instructor, Mr. D. D. Longmore (previously of the Leicester Club), and a ground engineer, Mr. T. H. Gundry.

At Que Que, the first centre visited, seven members of the local club obtained their "A" licences. From this point the school moved to Gatooma in January, where eight pupils went solo and three, according to latest information, obtained their "A" licences before the seasonal rains started.

Incidentally, this travelling school business may not always be as easy as it may sound. At Que Que, for instance, the work was carried out from an aerodrome which consists of two strip runways 100yd. wide and 800yd. long, which have been cut out of the bush. By way of contrast, the landing ground at Gatooma is approximately 1,000yd. square and has an excellent surface.

This school has been made possible through the gift of Sir Abe Bailey, and is usefully subsidised by the South African Government. The established training centres in Southern Rhodesia are at Salisbury and Bulawayo.

Out-and-Home Record

A FLIGHT from Sir Lindsay Everard's aerodrome at Ratcliffe, Leicester, to West Bromwich and return (a distance of 80 miles), was made on April 7 by Sqn. Ldr. W. B. Murray of the London Gliding Club. This is a British record for out-and-home soaring flight. He was launched by aeroplane-tow at 11.10 a.m., and by 2 p.m. had reached West Bromwich, 40 miles way. Before crossing Birmingham on his outward flight he had to spend an hour near Castle Bromwich aerodrome in gaining height to 4,700ft.

C.A.G. in Sweden

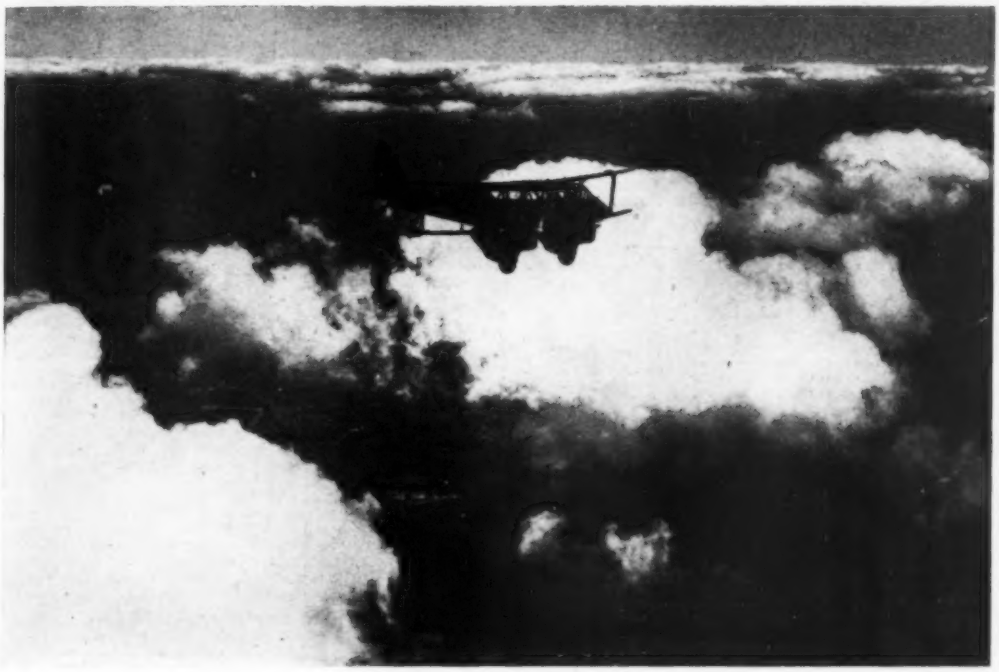
SOME time ago we mentioned the fact that the Swedish Government had proposed to institute a variation of our own Civil Air Guard scheme, and the details of this have now been published. In general, the idea is to encourage private flying by offering a series—actually 175 in all—of annual prizes. At the estimated cost of training each prize-winner will be able to obtain a licence at an actual cost of about £25.

According to schedule the scheme should start on July 1 this year, though a further proposal to open a central flying school for professional training is not likely to be in action before the same date in 1940.

The Travelling Flying School (referred to above) ready for action with the instructor's car, the tent and the Tiger Moth. The place is Gatooma, Rhodesia

AIRLINE COMPANIES of the WORLD

Details of the Routes Operated by 170 Concerns : Addresses and Flying Equipment



One of Western Airways D.H. Rapides over Weston ; the company's base aerodrome is half-covered by cloud on the right of the picture.

ALL those who have dealings with airline operating companies, or are interested in air services in different parts of the world will find this guide of particular value. When studied in conjunction with the loose-inset map to be found in this special issue, it will provide most of the essential facts—as well as flying equipment information not to be found in combined or individual time-tables. Where this country is concerned, both airline operators and charter operating companies are included, with condensed details of each company's composition at the present moment.

GREAT BRITAIN and IRELAND

AER LINGUS TEORANTA.

Address.—39, Upper O'Connell Street, Dublin (see *West Coast Air Services*).

ALLIED AIRWAYS (GANDAR DOWER), LTD.

Address.—Aberdeen Airport, Dyce. *Directors.*—E. L. Gandar Dower (Managing), R. S. Bissett, W. Baillie and C. Brunning. *Composition of company.*—Private. *Routes served.* — Aberdeen-Thurso-Kirkwall-Stromness, Thurso-Kirkwall, and Thurso-St. Margaret's Hope-Stromness; direct Aberdeen-Shetland service starting on June 10. *Fleet.*—1 D.H.86B, 2 D.H. Rapides, and 3 D.H. Dragons; 1 D.H. Rapide on order.

BRITISH AIRWAYS, LTD.

Address.—Terminal House, 52, Grosvenor Gardens, Victoria, London, S.W.1 (operating from Heston Airport). *Directors.*—The Hon. Clive Pearson (Chairman), W. D. L. Roberts (Vice-chairman), Sir Robert Burton-Chadwick, G. d'Erlanger, E. L. Granville, the Viscount Monsell, E. H. Murrant, W. C. Tomlinson and Major J. R. McCrindle (Managing). *Composition of company.*—Formed on October 1, 1935, by the amalgamation of Hillman's Airways, United Airways and Spartan Airlines. In August, 1936, the operating assets of British Continental Airways were acquired. Subsidy is received for European passenger and mail services and for the development of services to West Africa and South America. *Fleet.*—7 Lockheed 14, 6 Lockheed 10A, 3 Junkers Ju.52, and 1 Fokker F12; the new Fairey F.C.1 has been based on the operational requirements of British Airways. *Routes served.*—London-Berlin-Warsaw, London-Frankfurt-Budapest, London-Brussels, London-Hamburg-Copenhagen-Stockholm, London-Paris (with Imperial Airways), and London-Cologne-Hanover-Berlin (night mail); the London-Bathurst section of the proposed British West African and South American service has been surveyed and the London-Lisbon section should be in operation this year.

BRITISH COASTAL AIRWAYS, LTD.

Address.—109, Pilgrim Street, Newcastle-on-Tyne. *Directors.*—J. T. Gillie (Managing). *Composition of company.*—Nominal capital of £1,000; interested in the operation of marine air services in the British Isles and Europe, an application has been made to the Air Ministry for permission to run a service to Holland.

CHANNEL AIR FERRIES.

Address.—Shoreham Airport, Shoreham, Sussex (see *Great Western and Southern Airlines*).

GREAT WESTERN AND SOUTHERN AIRLINES.

Address.—Shoreham Airport, Shoreham, Sussex (Registered Office, 88, Kingsway, London, W.C.2). *Directors.*—J. B. Elliot (Chairman), K. W. C. Grand, J. S. Wills, Wing Cdr. A. H. Measures, J. S. Comber, and Capt. G. P. Olley (Managing). *Composition of company.*—Formed of Southern Railway, Great Western Railway and Channel Air Ferries interests.—*Routes served.*—Liverpool-Manchester-Birmingham-Bristol-Southampton-Ryde, Shoreham-Ryde-

Highland Airways—now part of the Scottish Airways system—pioneered the Orkney service. Here is the old Monospar S.T.4 as it was delivered for the Inverness-Kirkwall run in April, 1933; Capt. E. E. Fresson is on the left.

Bournemouth-Bristol, Heston-Croydon-Ryde, Bristol-Exeter-Plymouth-Penzance, Penzance-Scilly Islands. *Fleet.*—D.H. Rapides and Dragons.

IMPERIAL AIRWAYS, LTD.

Address.—Airway Terminus, Victoria Station, London, S.W.1 (operating from Croydon and Southampton). *Directors.*—Sir J. C. W. Reith (Chairman), Sir J. G. Beharrell, I. C. Geddes, the Hon. Esmond Harmsworth, Sir Francis L. Joseph (Government), Sir Hardman Lever, Sir John L. Maffey, Sir James F. G. Price, Air Marshal Sir John M. Salmond (Government), and H. Scott-Paine. *Composition of company.*—Shortly to become public corporation by association with British Airways. Subsidised by the Government and the Post Office for all services. In March last year the authorised share capital was £5,000,000 and the issued capital was £1,648,869. *Routes served.*—London-Paris, London-Basle-Zurich, London-Le Touquet, Southampton-Marseilles - Rome-Alexandria-Khartoum-Kisumu-Mombasa-Mozambique-Durban, Southampton - Marseilles - Rome - Alexandria-Habbanya-Basra - Karachi - Gwalior - Calcutta - Penang-Singapore (in association with Qantas Empire Airways), Sourabaya-Darwin-Townsville-Sydney, Bangkok-Hong Kong, Khartoum-Lagos, and New York-Bermuda. *Fleet.*—(In October, 1938) 23 Short Empire boats, 8 modified Empire boats (some still under construction), 2 Short Scyllas, 7 H.P.42, 4 A.W. Atalantas, 10 D.H.86, 14 A.W. Ensigns (some under construction) and 3 D.H. Albatross; 3 Short G-class boats and 4 D.H. Albatross on order; part interest in Mayo Composite machine.

ISLE OF MAN AIR SERVICES.

Address.—Isle of Man Airport, Derbyhaven. *Directors.*—H. G. N. Read (Chairman), Wing Cmdr. A. H. Measures, Capt. G. P. Olley, J. W. S. Comber, A. E. Robertson, and C. S. Edgar. *Composition of company.*—Formed by Isle of Man Steam Packet Company, the London, Midland and Scottish Railway and Olley Air Service, with equal holdings. *Routes served.*—Manchester-Liverpoole-Isle of Man, Isle of Man-Belfast, Isle of Man-Carlisle, Liverpool-Blackpool-Isle of Man, Blackpool-Isle of Man. *Fleet.*—6 D.H. Rapides and 1 D.H. Dragon.

JERSEY AIRWAYS.

Address.—1, Mulcaster Street, Jersey (operating from Jersey Airport). *Directors.*—W. D. L. Roberts, H. Mansbridge, K. W. C. Grand, W. L. Thurgood, and the Hon. H. N. Morgan-Grenville. *Composition of company.*—Limited liability company, incorporated in Jersey. *Routes served.*—Jersey-Southampton, Jersey-Heston, Jersey, Exeter, Jersey-Brighton, Jersey-Guernsey and Jersey-Dinard. *Fleet.*—6 D.H.86.

LUNDY AND ATLANTIC COAST AIR LINES, LTD.

Address.—Barnstaple Aerodrome, N. Devon. *Directors.*—R. T. Boyd, F. W. Gagde. *Routes served.*—Barnstaple-Lundy Island. *Fleet.*—1 Monospar S.T.4 and 1 Short Scion.

NORTH-EASTERN AIRWAYS, LTD.

Address—Airport of London, Croydon, Surrey. *Directors.*—Lord Grimthorpe (Chairman), F. C. R. Jaques, Admiral Sir Cyril Fuller, Major J. E. D. Shaw, Lord Nigel Douglas-Hamilton, F. W. Jones, A. E. Hewitt. *Composition of company.*—Private, authorised share capital £100,000. *Routes served.* — Croydon-Newcastle-Grangemouth-Perth, Aberdeen. *Fleet.*—7 D.H. Rapides.

PORTSMOUTH, SOUTHSEA, ISLE OF WIGHT AVIATION.

Address.—Isle of Wight Aviation, The Airport, Portsmouth. *Directors.*—Flt. Lt. F. L. Luxmoore, A. G. Murray, L. M. J. Balfour and W. H. Jenks. *Composition of company.*—Private. *Routes served.*—Portsmouth-Ryde, Southampton-Ryde, Bournemouth-Ryde and Portsmouth-Sandown/Shanklin. *Fleet.*—5 Airspeed Couriers, 3 Monospar S.T.25, 1 Airspeed Ferry and 1 D.H. Fox Moth.

The inset map in this issue will be found of particular interest in connection with this guide.

RAILWAY AIR SERVICES.

Address.—Airway Terminus, Victoria Station, London, S.W.1 (operating from Croydon). *Directors.*—Sir Harold Hartley (Chairman), Lt. Col. H. Burchall, O. H. Corble, J. B. Elliot, K. W. C. Grand, and G. A. Read. *Composition of company.*—Formed by four main-line railways—the London, Midland and Scottish, London and North-Eastern, Great Western and Southern Railways—with Imperial Airways and Coast Line. *Routes served.*—Croydon-Birmingham-Manchester, Liverpool-Isle of Man-Belfast, Belfast-Glasgow, Croydon-Manchester-Liverpool-Glasgow. *Fleet.*—D.H.86 and D.H. Rapides.

SCOTTISH AIRWAYS, LTD.

Address.—36, Academy Street, Inverness, and Renfrew Airport (operating from Inverness and Renfrew Airports). *Directors.*—W. D. L. Roberts (Chairman), E. E. Fresson, H. T. Leith, Major J. R. McCrindle, G. Nicholson, J. W. Ratledge, H. G. N. Read, W. Yeaman, and Wing Cdr. A. H. Measures (Managing). *Composition of company.*—Shares held by Northern Airways, Highland Airways, London, Midland and Scottish Railway, and David MacBrayne. *Routes served.*—Renfrew-Perth-Inverness, Renfrew-Campbeltown-Islay, and Inverness-Wick-Orkney-Shetlands. Projected services from Renfrew to Stornoway and Aberdeen-Inverness - Stornoway. *Fleet.*—3 D.H. Rapide, 3 D.H. Dragon and 4 Spartan Cruisers.

SOUTHERN AIRWAYS, LTD.

Address.—17, Manchester Square, London, W.1 (operated from Ramsgate Airport). *Directors.*—Whitney Straight and O. G. E. Roberts. *Composition of company.*—Unit of Straight Corporation. *Routes served.*—London (Ilford)-Ramsgate-Clacton-Ipswich, calling at Southend on request. *Fleet.*—2 D.H. Dragons or Rapides.

WEST COAST AIR SERVICES, LTD.

Address.—Airport of London, Croydon (Registered Office, 88, Kingsway, London, W.C.2). *Directors.*—J. W. S. Comber (Chairman), Capt. G. P. Olley, H. C. Milman and J. S. Wills. *Composition of company.*—Authorised capital £10,000, issued capital £3,999; all capital held by Olley Air Service. Operated London-Dublin service jointly with Aer Lingus Teoranta. *Routes served.*—London-Bristol-Dublin and Dublin-Isle of Man. *Fleet.*—1 D.H.86 and 1 D.H. Rapide.

WESTERN AIRWAYS.

Address.—The Airport, Weston-super-Mare. *Directors.*—Whitney Straight, Lord Apsley, O. G. E. Roberts and L. I. Arnott. *Composition of company.*—Unit of Straight Corporation. *Routes served.*—Weston-Cardiff, Bristol-Cardiff-Swansea, Swansea-Barnstaple-Newquay-Penzance and Weston-Bristol-Birmingham-Manchester. *Fleet.*—3 D.H. Rapides and 5 D.H. Dragons.

BRITISH CHARTER COMPANIES

AIR COMMERCE, LTD.

Address.—Heston Airport, Hounslow, Middx (Registered Office, 88, Kingsway, London, W.C.2). *Directors.*—R. P. W. Adeane (Chairman), J. W. S. Comber, L. H. Stace, and J. S. Wills. *Composition of company.*—Authorised capital £30,000, issued capital £24,446. Whole of capital held by British and Foreign Aviation, Ltd. *Fleet.*—2 D.H. Rapides, 1 Dragonfly, 1 D.H. Leopard and 1 Percival Vega Gull.

AIR DISPATCH, LTD.

Address.—Airport of London, Croydon. *Directors.*—The Hon. Mrs. Victor Bruce (Managing), Viscount Scarsdale, Flt. Lt. Eric Noddings, and N. M. Poole. *Composition of company.*—Nominal capital of £100, held by the four directors. *Fleet.*—9 D.H. Dragons, 3 D.H. Rapides, 5 D.H. Dragonflys and 1 Monospar S.T.4; 3 D.H. Rapides on order. Air Dispatch operate a Croydon-Le Touquet service in the summer and are responsible for *Inner Circle Air Lines*, which runs services connecting London aerodromes.

AIR TAXIS, LTD.

Address.—Airport of London, Croydon, Surrey. *Directors.*—Capt. C. W. Allen, J. D. Smith and F. Bingham. *Composition of company.*—Capital £8,000. *Fleet.*—1 D.H. Dragon, 2 Short Scions, 2 D.H. Puss Moths, 1 D.H. Leopard Moth, 1 Airspeed Courier.

BIRKETT AIR SERVICE, LTD.

Address.—Heston Airport, Hounslow, Middx. *Directors.*—Flt. Lt. G. Birkett and D. D. Birkett. *Fleet.*—1 D.H. Dragonfly, 1 Miles Merlin and 3 Leopard Moths.

BRIAN ALLEN AVIATION.

Address.—Hanworth Air Park, Feltham, Middx. *Directors.*—B. S. Allen (Managing), L. L. Irvin (U.S.A.) and C. H. Gaskin. *Fleet.*—1 Cessna.

BRITISH-AMERICAN AIR SERVICES, LTD.

Address.—Heston Airport, Hounslow, Middx. *Directors.*—D. S. Gibbs (U.S.A.), Major M. Peto and L. H. Falk. *Fleet.*—1 D.H. Leopard Moth, 1 Percival Vega Gull, 1 Heston Phœnix, 1 D.H.86 and 2 D.H. Rapides. This company specialises in services to race meetings.

OLLEY AIR SERVICE, LTD.

Address.—Airport of London, Croydon (Registered Office, 88, Kingsway, London, W.C.2). *Directors.*—Capt. G. P. Olley (Chairman and Managing), E. A. Blockley, J. W. S. Comber, Lady Cunliffe Owen, H. C. Milman and J. S. Wills. *Composition of company.*—Authorised and issued capital £6,015, the whole of the capital held by *British and Foreign Aviation.* Olley Air Service owns the whole of the issued capital of West Coast Air Services and one-third of the capital of Isle of Man Air Services. *Fleet.*—8 D.H. Rapides, 2 D.H. Leopard Moths, 1 D.H. Dragonfly and 1 Percival Vega Gull.

PERSONAL AIRWAYS, LTD.

Address.—Airport of London, Croydon. *Directors.*—The Hon. P. R. L. Beatty, the Hon. P. Playdell-Bouverie, W. Ledlie, Viscount Forbes and W. H. C. Rollo. *Fleet.*—2 D.H. Rapides, 1 D.H. Dragonfly, 1 D.H. Leopard Moth, 1 Miles Falcon Six; 2 Percival Q6s on order.

AIRLINE COMPANIES OF THE WORLD (CONTINUED)

SURREY FLYING SERVICES.

Address.—Airport of London, Croydon. *Directors.*—F. W. J. Grant and W. G. Macdonald. *Fleet.*—1 D.H. Dragon, 1 D.H. Fox Moth and 1 D.H. Puss Moth.

UTILITY AIRWAYS, LTD.

Address.—Merseyside Air Park, Hooton, Cheshire. *Directors.*—E. J. Davison (Chairman) and W. F. Davison. *Fleet.*—1 Monospar S.T.25, 1 D.H. Fox Moth, 2 Avro Cadets, 1 Avro 504 N four-seater. The company proposes to start an air service along the North Wales and West of England coast when aerodrome facilities are available.

WRIGHTWAYS, LTD.

Address.—Airport of London, Croydon, Surrey (and Bush House, Aldwych, London, W.C.2). *Directors.*—The Hon. J. D. Kemp (Chairman), Lord Rochdale, W. G. Speat (Managing) and L. M. Haybittel (General Manager). *Composition of company.*—Private, with authorised capital of £20,000. *Fleet.*—3 D.H. Rapides and 2 D.H.86B. Wrightways operate a freight and passenger service to Paris; in June a seasonal service between Croydon and Dinard is to be started.

EUROPE

BELGIUM

SOCIETE ANONYME BELGE D'EXPLOITATION DE LA NAVIGATION AERIENNE (S.A.B.E.N.A.).

Address.—145, Rue Royale, Brussels (operating from Haren Aerodrome, Brussels). *Fleet.*—5 Junkers Ju.52, 8 Savoia-Marchetti S73, 3 Savoia-Marchetta S83 and 2 Douglas D.C.2; 1 S83 on order. *Routes served.*—Brussels-London, Brussels-Paris, Brussels-Cologne, Brussels-Ambers, Brussels-Dusseldorf-Essen-Berlin, Brussels-Frankfurt-Munich-Vienna, Brussels-Prague, London-Ostend-Le Zoute, Brussels-Marseilles-Algiers-Reggan-Belgian Congo, Leopoldville-Boma, Leopoldville-Lusando, Leopoldville-Coquilhatville-Stanleyville; projected service, Stanleyville-Costermansville-Usumbura.

BULGARIA

"RODNI KRILE" AERONAUTICAL CO., LTD.

Address.—6, Rue Zar Kroum, Sofia. No services operated.

CZECHOSLOVAKIA

CESKOSLOVENSKE STATNI AERO-LINIE (C.S.A.).

Address.—Vodickova ul. 20, Prague.

CESKOSLOVENSKA LETECKA SPOLECNOST (C.L.S.).

Address.—Vodickova ul. 38, Prague. The operations of these companies now taken over by *Deutsche Lufthansa A.G.*

DENMARK

DET DANSKE LUFTFARTSELSKAB A/S. (D.D.L.).

Address.—Kobenhavns Lufthavn, Kastrup, Denmark. *Fleet.*—2 Focke Wulf FW200 Condors, 1 Junkers Ju. 52, 2 Fokker F12 and 3 Fokker F7A. *Routes served.*—Malmö-Copenhagen-Berlin, Berlin-Copenhagen, Oslo-Gothenburg - Copenhagen-Hamburg-London, Amsterdam - Hamburg - Copenhagen-Malmö, Stockholm - Malmö-Copenhagen-Amsterdam, Copenhagen-Aalborg-Kristiansand, Hamburg-Esbjerg-Silkeborg-Aalborg, Aalborg-Copenhagen, Copenhagen-Esbjerg and (Mail only) Malmö-Copenhagen-Hanover.

FINLAND

AERO O/Y.

Address.—Aleksanterinkatu 7, P. Esplanadeikatu 2, Helsinki. *Fleet.*—2 Junkers Ju. 52 and 2 D.H. Rapides; 2 Focke Wulf Condors on order. *Routes served.*—Stockholm-Turku-Helsinki-Tallinn, Stockholm-Mariehamn, Helsinki-Lappeenranta-Viipuri-Imatra, Helsinki-Tampere-Vaasa-Oulu-Kemi and Helsinki-Tallinn-Riga-Kaunas-Konigsberg-Berlin; projected route, Kemi-Rovaniemi-Ivalo-Petsamo (Arctic Sea).

FRANCE

AIR AFRIQUE (SEE AFRICA).

AIR BLEU.

Address.—6, Boul. des Capucines, Paris (operating from Le Bourget). *Fleet.*—11 Caudron Simouns and 3 Caudron Goelands. *Routes served.*— (Mail only) Paris-Bordeaux-Mont de Marsan-Port Pau, Paris-Toulouse-Paerpingan, Paris-Clermont Ferrand-St. Etienne-Lyons-Grenoble and Marseilles-Nice.

AIR FRANCE.

Address.—2, Rue Marbeuf, Paris 8 (operating from Le Bourget). *Fleet.*—At January 1, 1939, 17 Bloch 220, 2 Dewoitine 333, 20 Dewoitine 338, 9 Potez 62/0, 2 Potez 63/1, 15 Wibault 282/283T, 9 Fokker F7B, 2 Breguet Saigons, 12 Liore H242 (flying boats), 3 Farman 2.200 and 1 Farman 2.220 (for Atlantic experiments); 5 Liore 470, 7 Liore 246 and 1 Bloch 161 on order. *Routes served.*—Paris-London, London-Le Touquet, Paris-Bruxelles-Amsterdam, Paris - Copenhagen-Stockholm, Paris-Frankfurt-Berlin, Paris-Strasbourg-Prague, Paris-Prague-Warsaw, Paris-Prague-Vienna-Budapest-Belgrade-Bucarest, Paris-Zurich, Paris-Geneva, Paris-Lyons - Geneva, Paris - Lyons - Marseilles-Cannes, Paris-Dinard-Jersey, Paris-La Baule, Paris-Vichy, Paris-Bordeaux-Biarritz, Paris-Toulouse, Toulouse-Barcelona-Oran-Casablanca-Dakar, Toulouse-Dakar, Natal-Rio de Janeiro-Buenos Aires-Santiago, Marseilles-Algiers, Marseilles-Ajaccio-Tunis, Marseilles-Cannes-Calvi (Corsica), Marseilles-Naples-Corfu-Athens-Tripoli (Liban), Marseilles-Tunis - Tripoli - Benghasi - Alexandria - Beyrouth - Baghdad - Basra - Karachi - Calcutta-Bangkok-Saigon-Hanoi-Hong Kong, Beyrouth-Baghdad-Tripoli (Liban), Dakar-Kayes - Tambacounda - Kaolac - Bamako, Dakar-Kayes-St. Louis-Dakar, Casablanca-Tangier-Lisbon and Marseilles-Barcelona.

AEROMARITIME (SEE AFRICA).

GERMANY

DEUTSCHE LUFTHANSA, A.G.

Address.—Berlin S.W.29, Flughafen *Fleet.*—Junkers Ju. 90, Junkers G38, Junkers Ju. 52, Junkers Ju. 86, Focke Wulf F.W.200, Heinkel He.111, Blohm and Voss H.A.139, Dornier Do 26, Dornier Do 18 and Heinkel He.116 (70 per cent. of fleet made up of Ju. 52). *Routes served.*—Berlin-Amsterdam-London, Danzig-Stettin-Hamburg, Berlin-Danzig - Konigsberg, Berlin - Copenhagen-Malmö, Berlin-Cologne-Paris, Berlin-Copenhagen, Berlin-Stockholm, Berlin-Munich-Venice-Rome, Berlin-Halle/L.-Nurnberg-Munich, Berlin-Frankfurt-Mannheim, Berlin-Halle/L.-Stuttgart-Zurich, Berlin-Posen-Warsaw, Berlin-Breslau-Gleiwitz-Vienna-Graz-Klagenfurt, Berlin-Stuttgart, Berlin-Vienna-Budapest-Belgrade-Sofia-Athens, Berlin-Essen/M. - Dusseldorf, Halle/L. - Erfurt-Frankfurt, Berlin-Breslau-Gleiwitz, Bremen-Berlin, Berlin-Halle/L.-Stuttgart-Geneva-Marseilles - Barcelona, Salamanca - Lisbon, Berlin-Frankfurt, Berlin-Dortmund-Cologne, Berlin-Nurnberg-Munich, Halle/L.-Nurnberg-Munich, Oslo - Gothenburg - Copenhagen, Copenhagen-Hamburg-London, Hamburg-Bremen-Essen/M.-Cologne-Saarbrucken, Amsterdam-Rotterdam-Cologne-Frankfurt-Milan-Rome, London-Brussels-Frankfurt-Munich-Vienna, Vienna-Prague-Dresden-Berlin, Berlin - Konigsberg - Kovno - Riga - Reval-Helsingfors, Berlin - Dresden - Reichenberg, Berlin-Chemnitz-Karlsbad-Munich, Cologne - Frankfurt - Mannheim - Karlsruhe-Freiburg, Berlin-Essen/M.-Dusseldorf, Mannheim - Frankfurt, Vienna - Venice - Milan, Budapest - Vienna - Salzburg-Munich-Zurich, Stuttgart-Zurich, Munich-Nurnberg-Frankfurt - Cologne - Essen, Freiburg - Stuttgart, Stuttgart-Friedrichshafen, Berlin-Halle/L.-Mannheim, Munich-Stuttgart, Berlin-Frankfurt, Berlin - Athens - Damascus - Baghdad-Teheran (Herat)-Kabul, Essen/M.-Borkum, Dusseldorf - Dortmund - Borkum - Norderney, Dortmund-Frankfurt-Nurnberg, Sofia-Istanbul, Munster-Hanover-Braunschweig-Berlin, Karlsruhe-Frankfurt, Frankfurt-Hanover - Bremen, Karlsruhe - Frankfurt-Hanover - Bremen - Wangerooge - Langeoog-Norderney, Baghdad-Basra-Jask-Karachi-Jodhpur - Allahabad - Calcutta - Rangoon-Bangkok, Saarbrucken-Frankfurt, Berlin-Budapest-Bukarest, Breslau-Dresden-Halle/Leipzig, Halle/L.-Frankfurt, Hamburg-Hanover - Frankfurt - Stuttgart, Hanover-Braunschweig - Magdeburg - Halle/L. - Nurnberg - Vienna, Hamburg - Wyk - Westerland, Hamburg - Wangerooge - Langeoog-Norderney - Borkum, Hamburg - Bremen-Amsterdam, Berlin - Kiel - Flensburg-Wyk-Westerland, Berlin - Hamburg, Hamburg-Berlin, Kiel-Hamburg, Halle/L.-Cologne, Dresden - Halle/L. - Dortmund Cologne, Cologne - Dusseldorf, Cologne - Amsterdam-Hanover-Berlin-Halle/L.-Cologne, Berlin-Hanover - Cologne - London, Cologne-Paris, Munich-Nurnberg-Frankfurt-Cologne, Berlin-Halle/L.-Dresden, Berlin-Hanover-Frankfurt-Stuttgart, Breslau-Berlin, Berlin-Danzig-Konigsberg, Cologne - Cherbourg, Berlin-Munich-Vienna, Berlin-Frankfurt, Cologne-Dortmund-Berlin, and Vienna-Breslau; projected, Berlin-New York, and Berlin-Fernost.

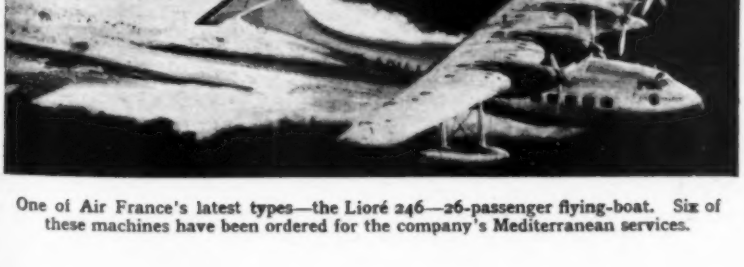
DEUTSCHE ZEPPELIN-REEDEREI, G.M.B.H.

Address.—Frankfort-on-Maine, 10, Hindenburg Platz, Germany. *Fleet.*—1 airship, LZ.130 Graf Zeppelin (40 passengers). *Routes served.*—Transatlantic service interrupted in May, 1937; date of resumption still uncertain and dependent on supply of helium from America.

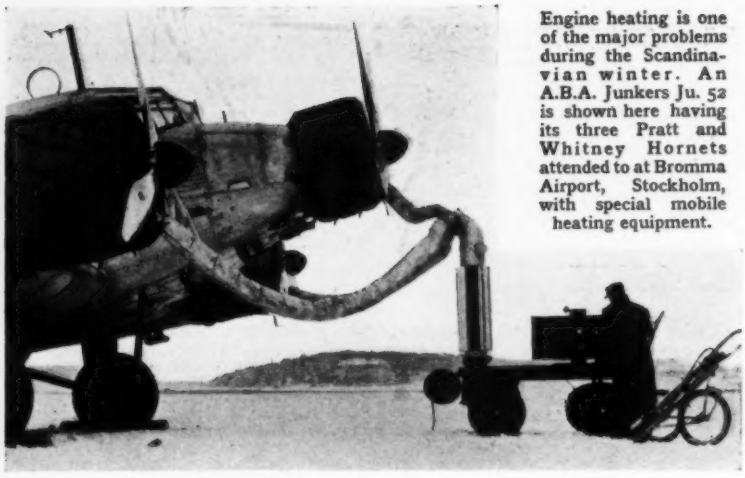
GREECE

SOCIETE HELLENIQUE DE COMMUNICATIONS AERIENNES S.A.

Address.—8, Rue Sophocles,, Athens, Greece. *Fleet.*—4 Junkers G.24 and 3 Jun-



One of Air France's latest types—the Lioré 246—26-passenger flying-boat. Six of these machines have been ordered for the company's Mediterranean services.



Engine heating is one of the major problems during the Scandinavian winter. An A.B.A. Junkers Ju. 52 is shown here having its three Pratt and Whitney Hornets attended to at Bromma Airport, Stockholm, with special mobile heating equipment.

kers Ju. 52. *Routes served.*—Athens-Salonica-Drama, Salonica-Athens, Athens-Agrinion-Jannina, and Athens-Crete.

HUNGARY

MAGYAR LEGIFORGALMI R.T. (M.A.L.E.R.T.).

Address.—Budapest, V. Dorottya-U.7. *Fleet.*—3 Junkers Ju. 52 and 2 Savoia-Marchetti 75; 1 Ju. 52 and 1 Savoia-Marchetti 75 on order. *Routes served.*—Budapest-Vienna, Budapest-Cracow-Warsaw, Berlin-Prague-Budapest-Arad-Bucharest, Budapest-Venice-Rome, and Budapest-Vienna-Salzburg-Munich-Zurich.

ITALY

ALA LITTORIA S.A., R.

Address.—Rome, Aeroporto del Littorio. *Fleet.*—14 CANT Z.506, 8 Macchi C.94 and 16 Savoia-Marchetti S.66 (seaplanes), 3 Savoia-Marchetti S.71, 18 Savoia-Marchetti S.73, 36 Savoia-Marchetti S.75, 3 Savoia-Marchetti S.74, 4 Breda 44, 1 Borea and 10 Caproni Ca.133. *Routes served.* — Rome-Tunis - Tripoli, Rome - Marseilles - Tripoli, Rome-Naples-Syracuse-Malta-Tripoli, Tripoli-Bengasi, Rome-Cagliari, Rome-Algiers, Geneva-Algiers-Cagliari-Tunis, Rome-Syracuse-Bengasi-Cairo-Wadi Halfa-Khartoum-Addis Abeba, Rome-Pollensa-Barcelona, Rome-Palma-Melilla-Cadiz, Rome-Geneva-Marseilles, Rome - Venice - Monaco - Berlin, Rome - Venice - Vienna - Budapest, Rome-Venice - Klagenfurt - Graz - Vienna, Rome-Brindisi - Athens - Rhodes, Rome - Brindisi-Athens-Rhodes-Haifa, Rome-Ancona, Rome-Bologna, Rome-Venice-Bratislava-Prague, Rome-Belgrade-Bucharest, Rome-Marseilles-Paris, Rome-Naples-Palermo-Catania-Malta, Rome-Naples-Palermo-Tunis, Trieste-Venice, Fiume-Pola-Venice, Trieste-Pola-Lucerne, Zara-Ancona, Trieste-Brindisi, Tunis-Tripoli, Khartoum-Asmara, Addis Abeba-Neghelli-Mogadiscio, Addis Abeba-Dire Daua-Gorrahei - Mogadiscio, Asmara - Assab, Addis Abeba-Dire Daua-Jibuti, Addis Abeba-Dire Daua-Assab, Addis Abeba-Gimma-Neghelli, Addis Abeba-Gimma, Addis Abeba-Gimma-Gambela-Dembidollo, Addis Abeba-Dondar-Asmara, Addis Abeba-Dessie-Asmara, Addis Abeba-Lechemti-Asosa, Melilla-Siviglia-Lisbon, Melilla-Tetuan, Tetuan-Malaga-Seville, Brindisi - Tirana - Salonica, Tirana-Scutari, Tirana-Coritza, Tirana-Vevoli, and Tirana-Valona - Argirocastro; . projected services, Rome - Brindisi - Athens - Rhodes - Haifa-Basra, and Rome-Melilla-Casablanca-Dakar-Natal-Rio de Janeiro and Buenos Aires.

AVIO LINEE ITALIANE S.A.

Address.—Via Giulini 3, Milan. *Fleet.*—No recent information available; last year this included 9 Fiat D.18 and 6 Savoia-Marchetti S.73. *Routes served.*—Milan-Turin-Paris-London, Milan-Venice, Rome-Milan-Frankfurt, Cologne-Rotterdam-Amsterdam, Turin - Rome, Turin - Milan - Venice-Zagred-Belgrade-Bucharest, Rome-Venice Budapest.

LATVIA

A Government service is run by the Latvian Post and Telegraph Department between Riga and Libau using 2 D.H. Rapides.

LITHUANIA

SUSISITKIMO MINISTERIJOS ORINIO.

Address.—Susisitkimo Inspekcija, Kaunas, Lithuania. *Fleet.*—2 Percival Q6. *Route served.*—Kaunas-Palanga; week-end flights to summer resorts; external services under consideration.

NETHERLANDS

KONINKLIJKE LUCHTVAART MAATSCHAPPIJ VOOR NEDERLAND EN KOLONIEN N.V. (K.L.M.).

Address.—The Hague, Hofweg 9, Holland (operating from Schiphol Airport, Amsterdam). *Fleet.*—1 Carley, 6 Koolhoven FK43, 1 Koolhoven FK48, 3 Fokker F7A, 1 Fokker F8A, 2 Fokker F22, 1 Fokker F36, 12 Douglas D.C.2, 20 Douglas D.C.3, 1 Lockheed 14 (see under South America for West Indies fleet). *Routes served.*—Amsterdam-Rotterdam-London, Amsterdam-Paris, Amsterdam-Berlin, Amsterdam - Manchester - Liverpool, Amsterdam - Rotterdam - Prague - Vienna-Budapest, Amsterdam-Rotterdam-Frankfort-Milan-Rome, Amsterdam-Bremen-Hamburg, Amsterdam-Copenhagen-Stockholm, Amsterdam-Copenhagen-Malmo, Amsterdam-Copenhagen-Norrkoping-Stockholm, Paris-Copenhagen-Stockholm, Amsterdam-Rotterdam-Cologne (night mail), Amsterdam-London (night mail), Amsterdam-Rotterdam-Basle-Zurich, Amsterdam-Christiansand-Oslo, Amsterdam - Rotterdam - Haamstede - Flushing-Knocke/Zoute, Amsterdam-Groningen-Leeuwarden - Amsterdam, Amsterdam - Twente, Amsterdam-Eindhoven, Amsterdam-Texel, Amsterdam - Leipzig - Budapest - Athens-Alexandria - Lydda - Baghdad - Basra - Jask-Karachi - Jodhpur - Allahabad - Calcutta - Rangoon - Bangkok - Penang - Medan - Singapore - Palembang - Batavia - Bandoeng (connecting by K.N.I.L.M. to Australia). See under South America for West Indies services.

NORWAY

DET NORSKE LUFTFARTSSELSKAP, FRED OLSEN AND BERGENSKE A/S. (D.N.L.).

Address.—Fred Olsen's Gate 2, Oslo, Norway. *Fleet.*—No recent information; last year the company used 3 Junkers Ju. 52, 1 Junkers W.34 and 1 Sikorsky S.43. *Routes served* (last year).—Oslo-Stavangar-Bergen-Trondheim-Tromso and Oslo-Gothenburg (mail only).

WIDEROE'S FLYVESELSKAP A/S.

Address.—Klingenberggt, 5, Oslo, Norway. *Fleet.*—No recent information available; last year the company used 1 Bellanca, 2 Stinson SR and 2 Wacos. *Routes served.*—Trondheim-Tronso-Kirknees.

POLAND

POLSKIE LINJE LOTNICZE (L.O.T.).

Address.—Ul. Nowogrodska 49, Warsaw 1. *Fleet.*—3 Douglas D.C.2, 3 Junkers Ju. 52, 10 Lockheed Electras, 2 Fokker F7, 4 Lockheed 14; 4 Lockheed 14 on order. *Routes served.* — Warsaw - Athens - Lydda - Beirut-Baghdad, Warsaw-Lemberg-Cernauti- Bucharest, Bucharest-Sofia-Salonica-Athens, Warsaw-Posen-Berlin, Warsaw-Cracow-Budapest, Warsaw-Katowice, Warsaw-Vilna-Kaunas-Riga-Tallinn-Helsingfors.

PORTUGAL

AERO PORTUGUESA LTDA.

Address.—33, Rua do Alecrim, Lisbon. *Fleet.*—1 Fokker F7. *Route served.*—Lisbon-Tangier-Casablanca.

RUMANIA

LINIILE AERIENE ROMANE EXPLOATE CU STATUL S.A. (L.A.R.E.S.).

Address.—Str. Aristide Briand No. 20, Bucharest. *Fleet.*—2 Douglas D.C.3, 4 Lockheed 14, 7 Lockheed 10A, 4 Savoia-Marchetti S83, 8 Potez 561, 5 Potez 560, 4 D.H. Rapides, 3 D.H. Dragonfly, 4 Junkers F13 and 1 Junkers Ju. 52. *Routes served.*—Constant - Bucharest - Belgrade - Zagreb-Venice - Milan, Bucharest-Cernauti-Lwow-Warsaw, Bucharest-Arad-Budapest-Prague-Berlin, Bucharest-Cetatea Alba, Bucharest-Chisinau, Bucharest-Severin-Arad, Bucharest-Balcic, Cernauti-Constant, Cernauti-Arad and Bucharest-Cluj-Satu Mare.

SPAIN

IBERIA AIRLINE.

Address.—6, Espoz y Mina, Salamanca. *Fleet.*—Junkers Ju. 52. *Routes served.*—Seville-Larache-Cabo Juby-Las Palmas, Barcelona - Saragossa - Burgos - Salamanca-Seville - Tetuan and Palma - Barcelona-Vitoria.

SWEDEN

A.B. AEROTRANSPORT (A.B.A.).

Address.—Kungsholmstorg 1, Stockholm. *Fleet.*—1 Fokker F8, 1 Fokker F12, 5 Junkers Ju. 52, 1 Junkers W34, 1 Junkers Ju. 86, and 3 Douglas D.C.3. *Routes served.*—Oslo - Gothenburg - Copenhagen, Berlin-Zurich, Stockholm-Visby, Stockholm-Mariehamn; (with K.L.M.) London-Amsterdam-Hamburg-Copenhagen-Stockholm, Malmo-Copenhagen-Amsterdam-Paris; (with K.L.M. and D.D.L.) Stockholm-Malmo-Copenhagen-Amsterdam; (with Air France and K.L.M.) Stockholm-Copenhagen-Paris; (with D.L.H., D.D.L. and D.N.L.) Oslo - Gothenburg-Copenhagen; (with D.D.L. and D.L.H.) Malmo-Copenhagen-Berlin; (with D.L.H.) Stockholm-Berlin; (with Aero O/Y) Stockholm-Turku-Helsinki-Tallinn; and (with Aeroflot) Stockholm - Riga - Velikije Luki-Moscow; the London-Stockholm service will be extended to Helsinki on July 1.

SWITZERLAND

ALPAR SCHWEIZERISCHE LUFTVERKEHRS A.G.

Address. — Flugplatz Berne. Fleet.—2 Koolhoven F.K.50, 2 D.H. Rapides, 2 Comtes and 1 Fokker F11. *Routes served.*—Zurich - Berne - Lausanne - Geneva, Berne-Basle and Berne-La Chaux de Fonds.

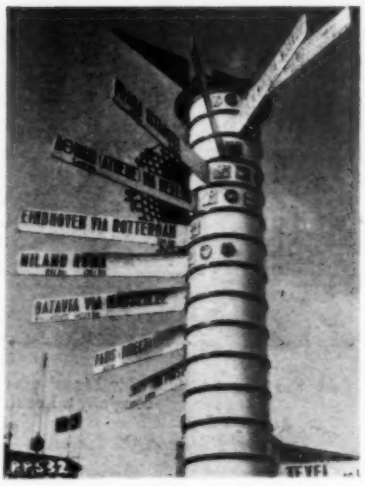
SWISSAIR (SWISS AIR TRAFFIC CO., LTD.).

Address.—Flugplatz, Zurich. *Fleet.*—4 Douglas D.C.3, 3 Douglas D.C.2, 1 D.H. Rapide, 1 Junkers Ju. 86, 1 Fokker F7A, and 1 Compte A.C.4. *Routes served.*—Zurich-Basle-London, Zurich - Basle - Paris, Geneva-Paris, Zurich-Stuttgart-Leipzig-Berlin, Basle-Zurich-Vienna, Zurich-St. Gallen-Munich (night mail only), Basle-Frankfurt, and (with K.L.M.) Zurich-Basle-Rotterdam-Amsterdam

TURKEY

TURKISH STATE AIRWAYS.

Address.—Ministry of Public Works, Ankara. *Fleet.*—4 D.H. Rapides, 4 D.H. 86B and 1 D.H.90; 3 Lockheed Electras on order. *Routes served.* — Ankara-Istanbul; extensions Ankara-Adana and Istanbul-Izmir should now be in operation.



AIRLINE CROSSROADS: An encouraging direction indicator at Schiphol, Amsterdam, the K.L.M. operational base.

AFRICA

ALA LITTORIA S.A. (SEE UNDER EUROPE).

COMPAGNIE DES CHARGEURS REUNIS (AEROMARITIME).

Address.—3, Boulevard Malesherbes, Paris. (Operating from Abidjan and Cotonou. *Fleet.*—5 Sikorsky S.43, 1 Sikorsky S.38, and 1 Caudron Goeland. *Routes served.*—Dakar-Point Noire and Cotonou-Niamey.

D.E.T.A. AIRWAYS.

Address.—Department of Ports and Railways, Lourenço Marques (London agents—Parry, Leon & Hayhoe, 219, Regent Street, London, W.1). *Fleet.*—6 D.H. Rapides, 3 Junkers Ju 52, 1 D.H. Dragonfly, and 1 D.H. Hornet. *Routes served.*—Lourenço Marques-Germiston, and Lourenço-Marques-Beira-Quelimane-Porto Amelia.

ELDERS COLONIAL AIRWAYS, LTD. (OPERATING FROM LAGOS).

Address.—Airway Terminus, Victoria, London, S.W.1. *Fleet.*—1 Short Scion Senior; services operated with Imperial Airways machines and crew. *Routes served.*—Lagos-Accra extension of Imperial service Khartoum-Lagos.

MISR AIRWORK S.A.E.

Address.—Almaza Airport, Heliopolis. *Fleet.*—5 D.H. Rapides, 2 D.H.86, 1 D.H.86B, 1 D.H. Dragonfly, and 1 D.H. Dragon. *Routes served.* — Cairo-Assiut-Luxor-Assuan, Alexandria-Port Said-Cairo-Minia-Assiut, Cairo-Port Said-Lydda-Haifa, Cairo-Lydda-Haifa-Baghdad, and Alexandria-Cairo.

REGIE AIR AFRIQUE.

Address.—35, Rue Saint-Didier, Paris. *Fleet.*—5 Bloch 12, 6 Caudron Goeland, 1 D.H. Dragon, 1 Potez 56, and 1 Potez 661; 3 Lockheed 14, and 3 Bloch 160 on order. *Routes served.* — Algiers-Niamey-Bangui-Stanleyville - Elizabethville - Quelimane Mozambique-Tananarive. Gayo-Bamako, Algiers-Tunis, Algiers-Oran, and Bangui-Brazzaville.

RHODESIAN AND NYASALAND AIRWAYS, LTD.

Address. — The Aerodrome, Salisbury, Southern Rhodesia (P.O. Box 210). *Fleet.*—3 D.H. Leopard Moths, 5 D.H. Rapides, and 1 D.H. Dragon. *Routes served.*—Salisbury-Bulawayo-Johannesburg, Salisbury-Gatooma-Que Que-Gwelo-Bulawayo, Salisbury-Beira, Salisbury-Lusaka, Salisbury-Blantyre-Lilongwe-Fort Jameson, Salisbury-Umtali-Beira, Blantyre-Beira, Lusaka-Mumbwa-Mankoya-Mongu, and Lusaka-Nyimba-Fort Jameson.

SERVICE DE L'AERONAUTIQUE CIVILE (S.A.C.)

Address.—Direction des Travaux Publiques, Tananarive. *Fleet.* — Caudron Simouns. *Routes served.* — Tananarive-Diego Saurez and Tananarive-Tulear-Fort Dauphin-Ihosy.

S.A.B.E.N.A. (SEE UNDER EUROPE).

SOUTH AFRICAN AIRWAYS.

Address.—Rand Airport, Germiston. *Fleet.*—11 Junkers Ju 52, 16 Junkers Ju 86, and 2 Junkers F13. *Routes served.*—Johannesburg-Kimberley-Capetown, Johannesburg-Bloemfontein-Cape Town, Johannesburg-Durban-East London-Port Elizabeth-Cape Town, Johannesburg-Palapye Windhoek, Johannesburg-Kimberley-Windhoek, Johannesburg - Bulawayo, Johannesburg-Lourenço Marques and Bulawayo-Kisuma; projected services Johannesburg-Windhoek-Loanda, Johannesburg-Loanda-Stanleyville-Kisumu - Johannesburg and Bulawayo-N'Dola.

WILSON AIRWAYS, LTD.

Address.—Rhodes House, Nairobi-Kenya Colony (operating from Nairobi). *Fleet.*—5 D.H. Rapides, 2 D.H. Dragonfly, 1 D.H. Dragon, 1 D.H. Leopard Moth, 2 D.H. Puss Moths, and 2 Percival Vega Gulls. *Routes served.*—Kisumu - Nairobi - Moshi-Dodoma-Mbeya-Mbiki-Broken Hill-Lusaka, Kisumu-Nairobi, Nairobi-Mombasa-Tanga-Zanzibar-Dar es Salaam, Kisumu-Kakamega-Eldoret-Nanyuki-Nairobi, Nairobi-Kisumu-Musoma-Mwanza-Geita, Dar es Salaam-Dodoma, Dar es Salaam-Kilwa-Utete-Mafia-Dar es Salaam.

Unloading a R.A.N.A. Rapide at Beira, where the company's service links up with that of Imperial Airways; the golf clubs remove any false ideas about "darkest Africa."

ASIA

CHINA

CHINA NATIONAL CORPORATION.

Address. — Chungking. *Fleet.*—D.C.2, Stinson Trimotor, Loening Amphibian and Consolidated Commodore; 2 D.C.3 on order. *Routes served.*—Rangoon-Kunming-Lashio-Chungking, Chungking-Kungming, Chungking-Ichang, Chungking-Chengu, Chingking-Kiating, Chungking-Hong Kong.

EURASIA AVIATION CORPORATION.

Address.—Chungking. *Fleet.* — Junkers Ju 52, W.33, W.34 and F.13. *Routes served.* —Chungking-Sian-Lanchow-Sining, Chungking-Kwelian-Kungming, Chungking-Kunming-Ninghsia, Kungming-Lanchow, Chungking-Hanoi, Chungking-Hong Kong; projected service, Chungking-Lanchow-Suchow-Hami-Urumchi-Almaty (U.S.S.R.).

INDIA, BURMA, MALAYA

AIR SERVICES OF INDIA, LTD.

Address.—Brabourne Stadium, Churchgate Street, Bombay (operating from Juhu Airport, Bombay). *Fleet.*—1 D.H. Rapide, 1 D.H. Dragonfly; 1 Airspeed Courier, 2 Percival Vega Gulls, and 2 D.H. Fox Moths. *Routes served.*—Bombay-Kathiwar, Bombay-Poona-Kolhapur; projected extensions, Kathiawar-Udaipur-Delhi, Kolhapur-Bangalore-Cochin, Jamnagar-Bhuj and Jamnagar-Okha.

INDIAN NATIONAL AIRWAYS, LTD.

Address.—Scindia House, Connaught Circus, New Delhi. *Fleet.*—2 D.H.83, 2 D.H. Dragons, 3 Beechcraft E17B, 1 D.H. Dragonfly, and 1 Avro 10. *Routes served.*—Karachi-Lahore and Lahore-Delhi; projected extension, Lahore-Rawalpindi-Kashmir.

INDIAN TRANSCONTINENTAL AIRWAYS, LTD.

Address.—9, Clive Street, Calcutta (operating from Karachi). *Fleet.*—6 A.W. Atalantas. *Routes served.*—Karachi-Jodhpur-Delhi-Allahabad-Goya-Calcutta. Associated company of Imperial Airways, and operates in conjunction with them.

IRRAWADDY FLOTILLA AND AIRWAYS, LTD.

Address.—P.O. Box 129, Rangoon. This company's services were closed down last November.

TATA SONS, LTD.

Address.—Bombay House, Bombay. *Fleet.*—(Last year) 3 D.H. Rapides, 1 D.H.86, 6 Waco WQC6, and 2 Miles Merlins. *Routes served.*—Karachi-Bhuj-Ahmedabad - Bombay - Hyderabad, Hyderabad-Madras-Trichinopoly-Colombo, Trivandrum-Trichinopoly, Bombay-Goa-Cannanore-Trivandrum, and Bombay-Indore-Bhopal-Gwalior-Delhi.

WEARNES AIR SERVICES, LTD.

Address.—Singapore Airport. Kallang.

AEROFLOT.

Address.—ul. 25 Oktiabria 6, Moscow. *Fleet.*—No reliable information available. *Routes served.*—Moscow-Leningrad, Moscow-Minsk, Moscow-Odessa, Moscow-Sochi, Moscow-Kuibyshev, Moscow-Baku-Tbilisi, Moscow-Simferopol, Moscow-Stalingrad-Astrakhan, Kharkov - Kiev, Kharkov - Odessa, Kiev-Odessa, Kiev-Rostov-Mineralnye Vody, Kiev-Simferopol, Tbilisi-Sukhumi, Tbilisi-Yerevan, Kutasi-Mestia, and Sukhumi-Sochi.

YUGOSLAVIA

SOCIETE DE NAVIGATION AERIENNE YOUGOSLAVE (AEROPOUT).

Address.—Knez Mihajlova 32, Beograd. *Fleet.*—4 Lockheed Electras, 2 Spartan Cruisers, 1 D.H. Rapide, 2 Caudron Goelands, and 1 D.H. Fox Moth. *Routes served.*—Zagreb-Belgrade, Skoplje-Belgrade, Belgrade-Sofia, Belgrade-Sarajevo, Belgrade-Dubrovnik, Zagreb-Dubrovnik, Ljubljana-Zagreb, Bucharest-Milan, Zarajevo-Zagreb, Zagreb-Vienna, Belgrade-Podgorica.

AIRLINE COMPANIES (CONTINUED)

Singapore S.S. *Fleet.*—2 D.H.86, 2 D.H. Rapides, and 1 D.H. Dragonfly. *Routes served.*—Singapore - Kuala Lumpur - Ipoh-Taiping-Penang; projected extension to Kelantan.

JAPAN and MANCHUKUO

HUI T'UNG AVIATION CORP.

Address.—Peking. *Fleet.*—No recent information available. *Routes served.*—Peking-Chengte, Peking-Changchikou, Peking-Tientsin-Dairen and Tientsin-Chinchou.

MANSHYU KOHKU KABUSHIKI KAISHA (MANCHURIA AVIATION CO.).

Address.—Mukden. *Fleet.*—10 Junkers Ju 86, Fokker Super Universal, Fokker F7, and Heinkel He.116. *Routes served.*—Dairen-Mukden - Hsinking - Harbin - Chiammussu. Hsinking-Linhsi-Chengte-Mukden, Mukden-Dairen-Singisyu-Tuneua-Mukden, Hsinking-Seisin, Hsinking-Fuchin, Hsinking-Harbin. Harbin-Chiamussu-Fuchin-Mutanching - Harbin, Harbin-Heiho-Tsitsihar, and Mutanching-Suilenho.

NIPPON KOKUYUSO KAISYA (JAPAN AIR TRANSPORT CO., LTD.).

Address.—Hikokan Sibaku, Tokyo. *Fleet.*—Douglas D.C.3, Douglas D.C.2, Lockheed 14, Nakazima A.T., Fokker F7B, Airspeed Envoy, Fokker Super Universal, and Beechcraft C.17E. *Routes served.*—Tokyo-Osaka-Hukuoka - Keizyo - Dairen, Keizyo-Hoten-Sinkyo, Keizyo-Seisin, Hukuoka-Taikyu-Keizyo-Singisyu-Dairen, Hukuoka-Tsingtau-Tientsin-Pekin, Hukuoka-Shanghai-Nanking, Hukuoka-Naha-Taihoku, Taihoku-Taityu-Tainan-Mako, Tainan-Heito-Taito-Karenko-Giran - Taihoku, Osaka - Tokusima - Koti, Osaka - Nagoya - Tokyo-Sendai-Aomari-Sapporo, Osaka-Tottori-Matue, Osaka-Kanazawa-Toyama-Nagano-Tokyo, and Tokyo-Naganonigata; projected service to Pelew Islands. A merger of these three Japanese companies should now have come into effect.

NETHERLANDS EAST INDIES

KONINKLIJKE NEDERLANDSCH-INDISCHE .. LUCHVAART .. MAATSCHAPPIJ (K.N.I.L.M.).

Address.—Sluisbrug, Batavia. *Fleet.*—Douglas D.C.2, Lockheed 14, D.H. Rapide, Fokker F7B and Fokker F12. *Routes served.*—Batavia - Koepang - Darwin - Longreach-Sydney, Medan-Palembang-Batavia, Saigon - Singapore - Palembang - Batavia-Batavia - Sourabay - Bandjermasin - Palikpapan, Sourabaya-Makassar, Batavia-Semarang-Sourabaya-Den Pasar, Palikpapan-Tarakan, and Batavia-Bandoeng.

At the Trans-Canada Air Lines' operational base at Winnipeg, with two of the company's Lockheed 14s on the tarmac.

PALESTINE and IRAN

IRANIAN STATE AIRWAYS.

Address.—Ministry of Posts and Telegraphs (Department of Civil Aviation), Teheran. *Fleet.*—3 D.H. Rapides. *Routes served.*—Teheran-Baghdad; projected services Teheran-Bouchir, Teheran-Diarbakir (Turkey), and Teheran-Mechet.

PALESTINE AIRWAYS, LTD.

Address.—Assicurazione Generali Building, Princess Marie Avenue, P.O.B.617, Jerusalem (operating from Tel-Aviv Aerodrome). *Fleet.*—2 Short Scions and 1 D.H. Rapide; Short Scion Senior on order. *Routes served.*—Tel-Aviv-Haifa-Beyrouth; service to Cyprus starting next month.

THE PHILIPPINES

ILOILO-NEGROS AIR EXPRESS, INC.

Address.—Tiempo-Times Building, Oloilo. *Fleet.*—(Last year) 1 Sikorsky F.43, 1 Stinson SR, and 2 Stinson U. *Routes served.*—Manila-Iloilo-Del Monte-Davao, and Iloilo-Bacalod.

PHILIPPINE AERIAL TAXI COMPANY.

Address.—P.O. Box 1613, Manila. *Fleet.*—(Last year) 3 Bellanca Sky Rockets, 2 Wacos. *Routes served.*—Manila-Paracale, Manila-Bagio and Paracale-Naga.

SIAM

AERIAL TRANSPORT COMPANY OF SIAM, LTD.

Address.—Airways House, Bangkok. *Fleet.*—3 Fairchilds, 3 D.H. Puss Moths. *Routes served.* — Nakorm-Rajasima-Mahasarakam-Udorn-Nakon Panom.

CANADA

BRITISH YUKON NAVIGATION CO.

Address.—Commerce Building, Vancouver, B.C. *Fleet.*—No recent information available. *Routes served.*—Whitehorse-Dawson-Mayo.

CANADIAN AIRWAYS, LTD.

Address.—Airways Building, Winnipeg, Manitoba. *Fleet.*—2 Laird LCB200, 1 Lockheed Vega, 1 D.H. Fox Moth, 2 D.H. Dragons, 2 Stearman Mail, 1 Stinson Jr., 7 Junkers W.33 and 34, 1 Junkers Ju 52, 1 Fairchild FC2W2, 6 Fairchild 71C, 1 Fairchild Super 71, 5 Noorduyn Norseman, 2 Stinson Reliants, 3 Bellanca Pacemaker, and 2 D.H. Rapides. *Routes served.*—Charlottetown-Moncton, Sioux Lookout-Red Lake, Sioux Lookout-Pickle Lake, Kenora-McKenzie, Winnipeg-Red Lake, Lac du Bonnet-Bissett, Gods Lake-Winnipeg, Ilford-Sachigo, Gods Lake-Norway House, Prince Albert-Goldfields, Edmonton-Yellow Knife, Vancouver-Zeballos, Vancouver-Seymour-Inlet and Vancouver-Victoria.

CANADIAN COLONIAL AIRWAYS.

Address.—Montreal, Quebec. *Fleet.*—No recent information available. *Routes served.*—Montreal-Albany and Montreal-Ottawa.

DOMINION SKYWAYS, LTD.

Address.—807, Confederation Building, Montreal, Quebec. *Fleet.*—3 Fairchilds, 2 Wacos, 1 Noorduyn, Norseman and 1 Bellanca Pacemaker. *Routes served.*—Montreal Val d'Or-Rouyn and charter service throughout Quebec and eastern Ontario. This company also manages Newfoundland Skyways, Ltd., which hold exclusive air transportation rights in Labrador; Newfoundland Skyways operate 2 Bellanca Sky Rockets.

CANADIAN SCENES: Two of Dominion Skyways' staff (left) photographed some 500 miles from the company's base; radio equipment is rather more to them than a mere means of traffic control. Above is a Canadian Airways Junkers W.34 at Fort Chipewyan, with local inhabitants and a dog team to take the mail and freight from the machine to the settlement Note the tarpaulin cover on the engine and the two canoes lashed to the underside of the wings.

AIRLINE COMPANIES OF THE WORLD (CONTINUED)

MACKENZIE AIR SERVICE, LTD.

Address.—Edmonton, Alta. *Fleet.*—No recent information available. *Routes served.*—Edmonton-Goldfields-Fort Smith.

M. AND C. AVIATION CO., LTD.

Address.—M. & C. Building, Prince Albert, Sask. *Fleet.*—1 Stinson SR-8B, 1 Stinson Jr., 2 Standard Wacos, and 1 Fairchild FC2. *Routes served.*—Prince Albert-Montreal Lake-Lac la Ronge-Stanley-Souris R.-Big River-Dore Lake-Beauval-Ile a la Crosse-Buffalo Narrows-Clear Lake-Pine River-Buffalo River-Portage la Locag. Manufacturers of new type of ski-pedestal.

PRAIRIE AIRWAYS, LTD.

Address.—The Airport, Moose Jaw, Sask. *Fleet.*—2 Twin-engined Beechraft, 1 Cessna and 1 Waco. *Routes served.*—Regina-Moose Jaw-Saskatoon-Prince Albert-North Battleford.

QUEBEC AIRWAYS, LTD.

Address.—1010 Confederation Building, Montreal, Quebec. *Fleet.*—4 D.H. Rapides. *Routes served.*—Rimouski-Comeau Bay, Rimouski-Seven Islands, Seven Islands-Natashquan, Seven Islands-Havre St. Pierre, Natashquan-Harrington and Havre St. Pierre-Port Menier.

STARRATT AIRWAYS AND TRANSPORTATION, LTD.

Address.—Hudson, Ontario. *Fleet.*—3 Fairchild 82, 1 Noorduyn Norseman, 1 Travelair A6000A, 1 Beechcraft SC17R, 1 Beechcraft 18A, 1 Stinson Reliant, and 1 Fokker Super Universal. *Routes served.*—Kenora-Red Lake-Winnipeg, and services in Red Lake, Woman Lake, Pickle Lake areas.

TRANS-CANADA AIR LINES.

Address.—355, McGill Street, Montreal, Quebec (operating from Stephenson Field Airport, Winnipeg, Man.). *Fleet.*—9 Lockheed 14-H2 and 5 Lockheed 10-A (Electras); 1 Lockheed 14 on order. *Routes served.*—Montreal-Ottawa-Toronto-Winnipeg - Regina-Lethbridge-Vancouver, Lethbridge-Calgary-Edmonton, and Vancouver-Seattle; projected extensions Montreal-Moncton, Montreal-Toronto-Windsor, and Toronto-Buffalo.

WINGS, LTD.

Address.—Winnipeg, Man. *Fleet.*—No recent information available. *Routes served.*—Kenora-Rachin, Winnipeg-Central Manitoba area, Winnipeg-Red Lake, and Winnipeg-Gods Lake.

UNITED STATES

AIRLINE FEEDER SYSTEM, INC.

Address. — Administration Building, Newark Airport, New Jersey. *Fleet.*—No recent information available. *Routes served.*—New York-West Field (Mass.).

ALL-AMERICAN AVIATION, INC.

Address.—Morgantown, West Virginia. *Fleet.*—Stinson Reliants with mail pick-up device. *Routes served.*—Mail services to citizen towns in Pennsylvania and West Virginia; Philadelphia-Pittsburgh and Pittsburgh-Huntingdon in experimental operation.

AMERICAN AIRLINES, INC.

Address.—4848 W. 63rd Street, Chicago, Ill. *Fleet.*—9 Douglas D.S.T. Skysleepers, 13 Douglas D.C.2 and 26 Douglas D.C.3 Clubplanes; 5 D.C.3 Clubplanes on order *Routes served.*—Boston-Providence-Springfield-Hartford-New York, Chicago-Indianapolis - Cincinnati - Huntingdon-Charlestown-Elkins-Washington, Boston-Springfield-Syracuse-Rochester-Buffalo-Erie-Cleveland, Chicago-South Bend-Detroit-Buffalo-New York, Cleveland - Columbus - Bayton - Cincinnati-Louisville - Nashville, Chicago - Feoria-St. Louis-Tulsa - Oklahoma City - Dallas - Fort Worth, and New York-Philadelphia-Baltimore - Washington - Bristol-Memphis - Little Rock-Dallas-Fort Worth-El Paso-Douglas-Tucson-Phœnix-Los Angeles.

AMERICAN EXPORT AIRLINES.

Address.—American Export Lines, New York. *Fleet.*—1 long-range Consolidated flying boat. *Routes served.*—Projected services between New York, the Azores, Biscarosse and Marseilles, and between the U.S. and the Mediterranean countries.

BOSTON-MAINE AIRWAYS, INC.

Address.—Boston Airport, East Boston, Mass. *Fleet.*—4 Lockheed Electras. *Routes served.* — Boston-Manchester-Concord-Barre Montpelier - Burlington - Montreal, Boston-Portland-Lewistown-Augusta - Bangor, and Bangor - Presque Isle-Millinocket-Houlton-Caribou; projected service, Boston-New York.

BRANIFF AIRWAYS.

Address.—Braniff Building, Oklahoma City (operated from Dallas). *Fleet.*—7 Douglas D.C.2, 6 Lockheed Electras and 1 Stinson Reliant (for experimental work). *Routes served.*—Chicago-Kansas City-Wichita-Oklahoma-Dallas, Dallas-Austin-Waco-San Antonio-Corpus Christi-Brownsville, and Amarillo-Galveston-Fort Worth-Dallas-Houston; projected services, Kansas City-Desmoines-Rochester-Twin City, Desmoines-St. Louis, Denver-Kansas City-Memphis, Amarillo-Oklahoma-Tulsa-Memphis-Atlanta, San Antonio - Big Spring-Amarillo-Pueblo-Denver, Tulsa-Shreveport-New Orleans, Houston-Shreveport-Memphis and San Antonio-El Paso.

CHICAGO AND SOUTHERN AIRLINES, INC.

Address.—Lambertfield, Robertson, Mo. *Fleet.*—No recent information available. *Routes served.*—Chicago-New Orleans.

CONTINENTAL AIR LINES, INC.

Address.—Municipal Airport, Denver, Colorado. *Fleet.*—3 Lockheed 12, and 1 Stearman, 3PLB, for training. *Routes served.*—Denver - Colorado Springs-Pueblo-Santa Fe-Albuquerque-El Paso; projected services, Pueblo-Wichita, Albuquerque-New Mexico-El Paso, and Albuquerque-Roswell-Hobbs-Carlspad-New Mexico.

DELTA AIR LINES.

Address.—Delta Air Corporation, Monroe, Louisiana (operating from Atlanta, Georgia). *Fleet.*—5 Lockheed Electra 10B. *Routes served.*—Ft. Worth-Dallas-Jackson-Birmingham-Atlanta - Charleston; projected service, Atlanta-Cincinnati.

EASTERN AIR LINES, INC.

Address.—1775 Broadway, New York City (operating from Miami, Florida). *Fleet.*—10 Douglas D.C.2, 12 Douglas D.C.3, and 2 Stinson Reliants for training. *Routes served.*—New York-Philadelphia-Baltimore-Washington-Richmond-Charleston - Jacksonville-Daytona Beach-Miami, Memphis-Birmingham-Tallahassee-Tampa, Minneapolis-Chicago - Indianapolis - Louisville - Nashville - Atlanta - Jacksonville - Miami, New York-Washington-Charlotte-Atlanta-Montgomery-New-Orleans-Houston - Brownsville, New York-Washington-Richmond-Atlanta-Tallahassee-Tampa, Houston-San Antonia, Kansas City-St. Louis-Indianapolis-Atlanta-Jacksonville-Miami, New York-Washington-Jacksonville-Miami, Chicago-Louisville-Atlanta-Jacksonville-Miami, New York - Philadelphia - Baltimore-Washington, Atlanta-Jacksonville-Miami, Nashville-Atlanta-Jacksonville-Miami, and Washington-Jacksonville-Miami; projected service Houston-Brownsville.

GRAND CANYON AIRLINES.

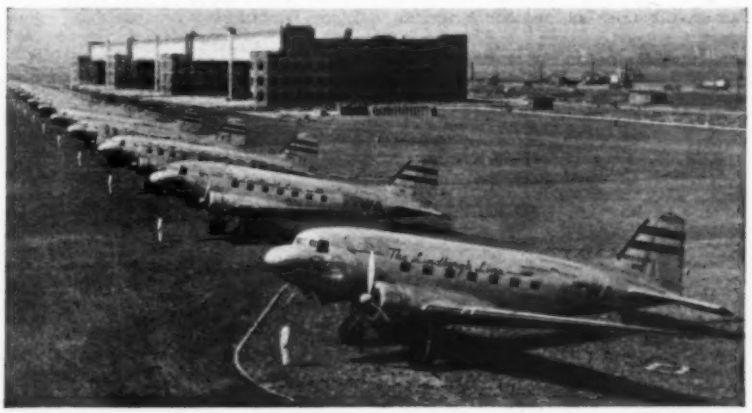
Address.—PO.125, Boulder City, Nevada. *Fleet.*—2 Travelair 6000, 1 Beechcraft B17L, 1 Waco UKC, 1 Fairchild 24 and 1 Travelair 4000. *Routes served.*—Charter operations at present, but air service proposed, Boulder City-Grand Canyon-Prescott-Phœnix.

INLAND AIR LINES.

Address.—Casper, Wyoming (operating from Cheyenne). *Fleet.*—6 Boeing 247D, 2 Lockheed Orions. *Routes served.*—Cheyenne-Casper - Sheridan - Billings - Lewistown-Great Falls, and Cheyenne-Rapid City-Spearfish-Pierre-Huron.

INTER-ISLAND AIRWAYS, LTD.

Address.—Fort and Merchant Streets, Honolulu, Hawaii. *Fleet.*—(last year) 3 Sikorsky S.43. *Routes served.*—Honolulu-Hilo, Honolulu-Wailuku, Honolulu-Port Allen.



An impressive line-up of part of the transcontinental and Western Air Fleet at Newark Airport, New Jersey; this sort of picture brings air transport into its true perspective.

MARQUETTE AIRLINES, INC.

Address.—Robertson, Mo. *Fleet.*—3 Stinson A. *Route served.*—St. Louis-Cincinnati-Dayton-Toledo-Detroit.

MID-CONTINENT AIRLINES.

Address.—Municipal Airport, Kansas City, Missouri. *Fleet.*—4 Lockheed Electra 10A and 2 Lockheed Vegas; Unitwin Vega monoplane on order. *Routes served.*—Tulsa-Kansas City-Omaha-Huron-Minneapolis, and Huron-Aberdeen-Bismarck; projected services Kansas City-Des Moines-Minneapolis, and Kansas City-Denver.

NATIONAL AIRLINES.

Address.—Incorporated Times Building, St. Petersburg, Florida. *Fleet.*—3 Lockheed Electras, and 2 Stinson Timotors. *Routes served.*—Miami-St. Petersburg-Daytona Beach, and Jacksonville-Pensacola-Alabama-New Orleans.

NORTHWEST AIRLINES, INC.

Address.—Holman Municipal Airport, St. Paul, Minn. *Fleet.*—Lockheed 14s. and Lockheed Electras. *Routes served.*—Chicago-Milwaukee-Minneapolis, Chicago-Rochester - Minneapolis, Chicago - Fargo, Chicago - Milwaukee - Fargo, Fargo - Butte-Seattle, Fargo-Helena-Wenatchee-Seattle, Spokane-Portland, and Fargo-Winnipeg.

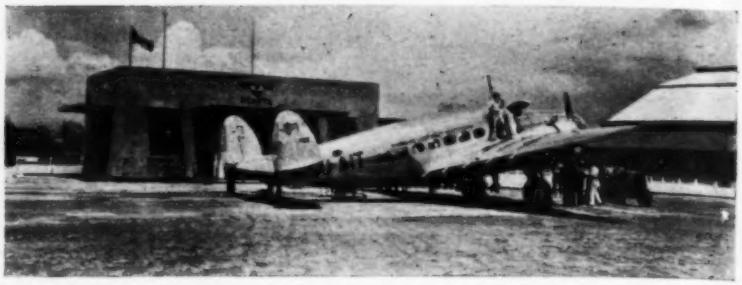
PACIFIC ALASKA AIRWAYS, INC.

Address.—1324 4th Avenue, Seattle, Washington, and 135, E.42nd Street, New York, N.Y. *Fleet.*—Lockheed Electras. *Routes served.*—Seattle - Juneau - Whitehorse - Fairbanks-Ruby-Nome, Fairbanks-McGrath-Flat, and McGrath-Bethel.

PAN-AMERICAN AIRWAYS.

Address.—135, E.42nd Street, New York, N.Y. *Fleet.*—About 130 in operation including Martin Clippers, Sikorsky 43, 42, 41, 40, and 38, Douglas D.C.2 and D.C.3, Douglas Dolphin, Lockheed Electras, Fairchild amphibians, Consolidated Condors, Ford Trimotors, Stinsons, Loening amphibians, Boeing 247, Junkers seaplanes, Clark seaplanes and Boeing 314 boats. *Routes served.*—Baltimore-Port Washington-Darrells Island (Bermuda), Miami-Nassau, Miami-Cat Cay, Miami-Port au Prince-San Pedro-San Juan, Port au Prince-Maracaibo, Coro-La Guaira, Kingston (Jamaica)-Santiago (Cuba)-Port au Prince, Miami-Antilla-Port au Prince-San Juan, St. Thomas-Antigua-Fort de France (Martinique)-Port of Spain-Georgetown-Paramaribo-Cayenne-Belem-Sao Luiz-Fortaleza-Natal-Recife-Maceio - Salvador - Victoria-Rio de Janeiro-Sao Paulo-Curityba-Iguassu-Porto Alegre-Asuncion-Buenos Aires, Miami-Havana, Cristobal-Barranquilla-Maracaibo-Coro-La Guaira-Guanta-Port of Spain, Miami-Havana-Merida, Brownsville (Texas)-Tampico-Mexico-Tapachula-Guatemala-San Salvador-Tegucigalpa-Managua-San José-David-Panama City-Cristobal, and San Francisco-Honolulu-Midway Is.-Wake Is.-Guam-Manila-Macao-Hong Kong; projected Atlantic service between New York and Europe.

Pan-American Airways are closely associated with China National Aviation, Cia Mexicana de Aviacion, Cia. Nacional Cubana de Aviacion, Pacific Alaska Airways, Pan-American-Grace Airways, Panair do Brasil, Panama Airways, Sociedad Colombo-Alemana de Transportes Aereos and Uraba, Medellin and Central Airways.



K.L.M. run a number of useful services in the West Indies: This photograph shows one of their Lockheed 14s being refuelled at Barranquilla, in Colombia. S.C.A.D.T.A. is that country's own operating company and the name will be seen on the terminal building behind the tail of the 14.

PENNSYLVANIA-CENTRAL AIRLINES CORP.

Address.—Allegheny County Municipal Airport, Pittsburgh, Pa. *Fleet.*—No recent information available. *Routes served.*—Washington-Pittsburgh - Cleveland - Detroit, Norfolk-Washington, Cleveland-Detroit, Detroit-Milwaukee, Grand Rapids-Chicago, Washington-Harrisburg-Baltimore - Buffalo Washington-Pittsburgh-Buffalo, and Detroit-Saulte Ste. Marie.

TRANSCONTINENTAL AND WESTERN AIR, INC. (T.W.A.).

Address.—Municipal Airport, Kansas City, Missouri, Mo. *Fleet.*—14 Douglas D.C.2, 10 Douglas D.C.3 sleepers, and 9 Douglas D.C.3 Clubships; 3 Douglas D.C.3 Clubships on order, Douglas D.C.4 and Boeing 307 being considered. *Routes served.*—New York - Philadelphia - Harrisburg - Pittsburgh - Columbus - Dayton - Indianapolis-St. Louis-Kansas City, New York-Pittsburgh-Chicago-Kansas City-Wichita-Amarillo-Albuquerque-Los Angelos, Dayton-Fort Wayne-Chicago, New York-Pittsburgh-St. Louis, Kansas City-Albuquerque-Los Angeles, Kansas City-Wichita-Amarillo-Albuquerque-Winslow-Boulder Dam-Las Vegas-Fresno-Los Angeles-San Francisco, New York-Philadelphia-Washington-Pittsburgh-Ohio, Boston-New York-Washington, and New York-Chicago.

UNITED AIR LINES TRANSPORT CORPORATION.

Address.—5059, South Cicero Avenue, Chicago (operating from Cheyenne, Municipal Airport, Wyoming). *Fleet.*—17 Boeing 247D, 9 Douglas D.C.3 sleepers and 26 Douglas D.C.3 dayplanes; Douglas D.C.4 fleet provisionally ordered for 1941. *Routes served.*—New York - Bethlehem - Cleveland-Toledo-Chicago-Moline-Iowa City-Desmoines-Omaha-Lincoln-Grand Island-North Platte-Cheyenne-Rock Springs-Salt Lake-Elko-Reno-Sacramento-San Francisco - Oakland, Philadelphia-Bethlehem-Cleveland, Omaha-Denver-Salt Lake, Cheyenne-Denver, San Francisco - Fresno - Bakersfield - Los Angeles - Long Beach - Santiago, San Francisco - Los Angeles, San Francisco-Santa Barbara-Los Angeles, Oakland-Medford-Portland-Tacoma-Seattle-Vancouver, Sacramento-Medford, Salt Lake-Boise-Pendleton-Portland, and Pendleton-Spokane.

WESTERN AIR EXPRESS CORP.

Address.—Union Air Terminal, Burbank, Calif. *Fleet.*—1 Douglas D.C.3 Skylounge, 2 Douglas D.S.T. sleepers, 4 Boeing 247D and 1 Waco. *Routes served.*—Los Angeles-Salt Lake City, Salt Lake City-Great Falls, and San Diego-Salt Lake City; projected extension Great Falls-Lethbridge, Alberta.

WILMINGTON - CATALINA AIRLINE, LTD.

Address.—Catalina Airport, Avalon, Calif. *Fleet.*—2 Douglas Dolphin amphibians; landplanes may be ordered this year. *Routes served.*—Avalon (Santa Catalina Island)-Wilmington (Los Angeles); projected land-plane service Avalon-Los Angeles.

SOUTH and CENTRAL AMERICA

ARGENTINA

AEROPOSTA ARGENTINA LTDA.

Address.—Presidente Saenzpena No. 540, Buenos Aires. *Fleet.*—(Last year) 3 Junkers Ju 52, 3 Latécoère 28, and 4 Latécoère 25. *Routes served.*—Buenos Aires-Bahia Blanca-Trelew-Commodoro Rivadavia, and Buenos Aires-Rio Grande.

CORPORACION SUD AMERICANA DE SERVICIOS AEREOS, S.A.

Address.—25 de Mayo 299, Buenos Aires. *Fleet.*—3 Macchi M.C. 94; 3 Savoia Marchetti seaplane on order. *Routes served.*—Buenos Aires-Montevideo; projected extension to Parana; in co-operation with Uruguayan company C.S.A.

COMPANIA GENERAL AERONAUTICA.

Address.—San Antonio Oeste. *Fleet.*—No information available. *Routes served.*—San Antonio-Bariloche.

BOLIVIA

LLOYD AER-O BOLIVIANO.

Address.—Casilla 132, Cochabamba. *Fleet.*—Junkers Ju 86, Junkers Ju 52, Junkers W.34 and Sikorsky S.38; Junkers Ju 90 on order. *Routes served.*—La Paz-Cochabamba, La Pez-Sucre-Cochabamba-Santa Cruz, Cochabamba-Trinidad, Santa Cruz-Pto. Suarez, Santa Cruz-Yacuiba, La Paz-Apolo, and Trinidad-Cachuela-Cobija.

BRAZIL

AERO LLOYD IGUASSU, S.A.

Address.—Curityba. Services suspended owing to lack of finance.

EMPREZA DE VIACAO AEREA RIO GRANDENSE (V. A.R.I.G.).

Address.—Porto Alegre, Caixa Postal 243, Brazil (operating from Rio Grande do Sul). *Fleet.*—1 Junkers Ju 52, 1 Messerschmidt BFW 108, 2 Junkers F.13, 1 Klemm 25, 1 Junkers A.50 and 1 Bucker Student. *Routes served.*—Porto Alegre-Pelotas-Yaguaron and Pelotas-Bagé-Libramento-Uruguaiana. Porto Alegre-Torres, and Porto Alegre-S. Cruz-Cr. Alta-Palemira; projected services, Porto Alegre-P. Fundo, Palmera-Irai and Porto Alegre-Cacapava-Quarai.

PANAIR DO BRASIL, S.A.

Address.—Avenida Rio Branco 177, Rio de Janeiro. *Fleet.*—(Last year) 5 Consolidated Commodores, 2 Sikorsky S.38, 2 Sikorsky S.43, 1 Lockheed Electra, and 2 Fairchild. *Routes served.*—Belem-Fortaleza-Natal-Recife-Salvador-Rio. Rio de Janeiro-Porto Alegre. Belem-Manaos-Porto Belho, Rio de Janeiro-Bello Horizonte-Pocos de Caldas.

AIRLINE COMPANIES OF THE WORLD (CONTINUED)

SYNDICATO CONDOR LTDA.

Address.—Rua da Alfandiga 5/3, Rio de Janeiro. *Fleet.*—Junkers Ju52, Junkers W.34, Junkers F.13 and Junkers F.24. *Routes served.*—Natal-Rio de Janeiro, Rio de Janeiro-Buenos Aires-Santiago, Fortaleza-Porto Alegre, Rio de Janeiro-Porto Alegre, Sao Paulo-La Paz-Lima, Fortaleza-Belem, and Buenos Aires-Montevideo.

VIACAO AERO SAO PAULO, S.A.

Address.—Sao Paulo. *Fleet.*—3 Junkers Ju 52, and 1 D.H. Dragon. *Routes served.*—Sao Paulo-Uberaba and Sao Paulo-Rio de Janeiro.

CHILE

LINEA AEREA NACIONAL.

Address.—The Airport, Santiago. *Fleet.*—2 Junkers Ju 86, 4 Trimotors, Curtiss Condor, and Potez 56; 2 more Junkers Ju 86 on order. *Routes served.*—Santiago-Puerto Montt, Santiago-Antofagasta-Arica, and Santiago-La Serena-Vallenar.

COLOMBIA

SOCIEDAD COLOMBO-ALEMANA DE TRANSPORTES AEREOS (S.C.A.D.T.A.).

Address.—P.O. Box 203, Barranquilla. *Fleet.*—(Last year) 4 Boeing 247, 7 Ford Trimotors, 2 Junkers F.13, 4 Junkers W.34 and 2 Sikorsky S.38. *Routes served.*—Barranquilla-Bogota, Barranquilla-Gamara-Palanquero-Girardot, Barranquilla-Medellin, Medellin-Bogota, Medellin-Cali, Bogota-Cali, Barranquilla-Bermeja-Honda-Bogota, Barranquilla-Cienaga, Barranquilla-Cartagena, Barranquilla-Pato, Barranquilla-Buenaventura, and Barranquilla-Turbo.

SERVICIO AEREO COLUMBIANO.

Address.—Bogota. *Fleet.*—2 Lockheed Electras, 1 Ford Trimotor, 2 Curtiss Condors and 3 Curtiss Kingbird. *Routes served.*—Bogota-Medellin-Cartago-Cali, and Medellin-Bogota.

URABA, MEDELLIN AND CENTRA AIRWAYS, INC.

Address.—Medellin. *Fleet.*—No recent information. *Routes served.*—Cristobal-Turbo-Medellin.

COSTA RICA

AEROVIAS NACIONALES, S.A.

Address.—Apartado 793, San José. *Fleet.*—3 Curtiss Kingbird, 2 Travelairs J.6-9, 1 Travelair Wasp, 1 Stinson Trimotor, 1 Stinson Reliant, 1 Waco and 1 Rearwin Speedster, 1 Ford Trimotor on order. *Routes served.*—San José-Santa Cruz, San José-Managua and San José to Guaracaste, Puntarenas, Limon, Sixaola, Barra del Colorado, Parrita, Paquita, Quepos, Boca Naranja, Pto. Jimenez and Pto. Cordes; projected services to Golfito, Coto and Cañas Gordas.

EMPRESA NACIONAL DE TRANSPORTES AEROS (E.N.T.A.).

Address.—P.O. Box 1450, San José. *Fleet.*—(Last year) Fokker 14b, Fokker Universal, Travelair and Ford Trimotor. *Routes served.*—San José-David, San José-Sardinal-San José, San José-Santa Cruz, San José, San José-Pto. Jiminez, San José-Nicoya, San José-San Ramon, San José-Rivas-Managna, San José-Villa-Quesada and San José-San Isidro.

CUBA

CIA. NACIONAL CUBANA DE AVIACION, S.A.

Address.—Prado 72-74, Esqa Trocadero, Havana. *Fleet.*—(Last year) 3 Lockheed Electras and 4 Ford Trimotors. *Routes served.*—Havana-Camagney, Havana-Guatanamo-Baracoa and Santiago-Baracoa.

ECUADOR

SOCIEDAD ECUATORIANA DE TRANSPORTES AEREOS (S.E.D.T.A.).

Address.—Quito. *Fleet.*—1 Junkers Ju 52, 1 Messerschmitt 108, 2 Junkers Ju 34 and 2 F. W. Weihe. *Routes served.*—Quito-Guayaquil, Quito-Lima and Quito-Bogota.

HONDURAS

TRANSPORTES AEREOS CENTRO-AMERICANAS (T.A.C.A.).

Address.—Tegucigalpa. *Fleet.*—Ford Trimotor, Bellanca and Stinson Junior. *Routes served.*—Tegncigalpa-Tela, Talanga-Olanchito, Juticalpa-Catacamas, Talanga-La Union, Tegncigalpa-Santa Rosa, San Pedro Sula-Santa Rosa, Santa Rosa-San Salvador, San Pedro Sula-La Ceiba, La Ceiba-Trujillo, Tegucigalpa-Yuscaran, Danli-Tegucigalpa, Tegucigalpa-San Lorenzo-Choluteca-Tegucigalpa, Managna-Pto. Cabezas, Managna-Matagalpa-Jinotega, Pto. Cabezas-Waspan-Bilwaskarna-Pto. Cabezas, Puerto Cabezas-Minerales Bonanza y Siuna, Guatemala-Quezaltenango - Guatemala, Guatemala-Coban - Guatemala, Guatemala - Peten-Puerto Barrios, Belice - El Cayo - Belice, Belice-Corozal-Belice, Managna-Tegucigalpa-San Salvador and Belice-Puerto Barrios-San Pedro Sula; projected extensions to Costa Rica and Panama.

MEXICO

CIA DE TRANSPORTES AEREOS DEL PACIFICO, S.A.

Address.—Carranza, 42, Desp. 304 (operating from Oaxaca). *Fleet.*—5 Travelair S.6000.B. *Routes served.*—Oaxaca-Acapulco; projected extension in the Mixteca Oaxaqueña.

CIA AERONAUTICA DEL SUR, S.A.

Address.—Apartado N.12 Villahermosa. *Fleet.*—No recent information available. *Routes served.*—Villahermosa-Tenosique, V-Comalcalco, V-Pichucalco, V-Alvaro Obregon, V-Salta de Agua, V-Coatzacoalos, V-Huimanguillo, and V-Orizaba.

CIA AERONAUTICA DE LA SIERRA, S.A.

Address.—Apartado 30, Parral, Chihuahua. *Fleet.*—1 Airtransport and 1 Wright. *Routes served.*—Parral-Guadalupe.

CIA MEXICANA DE AVIACION, S.A.

Address.—5 de Mayo y Bolivar, D.F. *Fleet.*—(Last year) 4 Douglas D.C.2, 3 Lockheed Electras and 3 Ford Trimotors. *Routes served.* — Merida - Villahermosa - Veracruz-Mexico, Tampico-Mexico and Los Angeles-Mazatlan-Mexico.

CIA TRANSPORTE AEREOS DE CHIAPAS, S.A.

Address.—Colima No. 368 A, Mexico D.F. *Fleet.*—No recent information available. *Routes served.*—Arriaga-Comitan-Tapachula, Tuxtla - Pichucalco-Salta, Mexico-Tuxtla-Tapachula, Merido-Belize, El Cayo-Belize, Los Lirios-Chetumal, Merida-Pto. Mexico, and Merida-Ciudad Chetumal-Merida.

LINEAS AEREOS MINERAS, S.A.

Address.—Bucarelia No. 12, Mexico D.F. *Fleet.*—No recent information available. *Routes served.*—Mazatlan-La Paz, M-Durango, M-San Ignacio, M-Limoncito, M-Islas Marilas, Mexico-Ciudal Tuarez, Toyoltita and Durango-Tollreon.

NETHERLANDS WEST INDIES

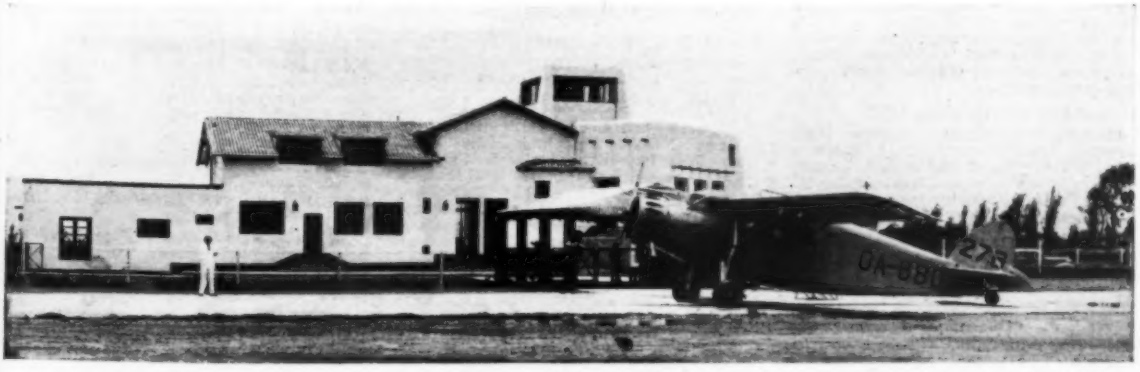
KONINKLIJKE LUCHTVAART MAATSCHAPPIJ VOOR NEDERLAND EN KOLONIEN (K.L.M.).

Address.—De Ruyterkade 3, Willemstad, Curaçao, N.W.1 (operating from Hato Airport, Curaçao). *Fleet.*—Lockheed 14 and 2 Fokker F.18. *Routes served.*—Curaçao-Trinidad-Barbados, Barbados-Trinidad-La Guaira-Curaçao, Curaçao-Bonaire, Curaçao-Aruba, Curaçao - Aruba-Maracaibo-Barranquilla, and Curaçao-Coro; projected services, Curaçao-Trinidad-Paramaribo and Trinidad-Ciudad Bolivar.

PERU

COMPANIA DE AVIACION "FAUCETT," S.A.

Address.—Edificio Hotel Bolivar No. 926, Lima (operating from Santa Cruz Airport, Lima). *Fleet.*—9 Faucett Specials. *Routes served.*—Lima - Chimbote - Trujillo - Pacasmayo-Chiclayo-Piura-Sullana-Talara, Lima-Chiclayo, Lima-Nazca-Yauca-Chala-Atico-Camana-Arequipa-Tacna and Lima-Chiclayo-Tarapoto.



One of the Faucett specials used by C. de A. "Faucett" outside the terminal building at Santa Cruz aerodrome, Lima, Peru.

PAN AMERICAN GRACE AIRWAYS, INC. (PANAGRA).

Address.—Grace Building, Lima. *Fleet.*—Douglas D.C.2s and Douglas D.C.3s. *Routes served.*—Arica-La Paz-Salta-Buenos Aires, Cristobal-Guayaquil-Lima-Arica and Arica-Santiago-Buenos Aires.

LINEA AEREA NACIONAL.

Address.—Comandancia General de Aeronautica, Avenida Arequipa, Miraflores, Lima. *Fleet.*—Boeing, Travelair, Fairchild, Keystone and Hamilton. *Routes served.*—San Ramon-Pucallpa-Iquitos-Pto. Maldonado, Iquitos-Borja, Iquitos-Gueppi and Iquitos-Ramon Castilla.

CONDOR PERUANA DE AVIATION, S.A.

Address.—Edeficio Dall'Orso, Plaza San Martin No. 117, Lima. *Fleet.*—4 Curtiss Condors. *Routes served.*—Lima-Trujillo-Cajamarca-Chachapoyas-Moyobamba-Iquitos and Lima-Piaz.

URUGUAY

CAMPAGNIA AERONAUTICA URUGUAYAS, S.A. (C.A.U.S.A.).

Address.—Montevideo. *Fleet.*—2 Junkers Ju 52. *Routes served.*—Montevideo-Buenos Aires.

CAMPAGNIA AERONAUTICA EXPRESO DEL PLATA.

Address. — Montevideo. *Fleet.* — D.H. Dragonfly and D.H. Rapide seaplanes. *Route served.*—Buenos Aires-Colonia.

PRIMERAS LINEAS URUGUAYAS DE NAVEGATION (P.L.U.N.A.).

Address.—Agraciada 1430, Montevideo. *Fleet.*—2 D.H. Dragonfly and 2 D.H.86B. *Routes served.*—Montevideo-Durango-Tacuarembo-Rivera and Montevideo-Paysandu-Salto-Artigas.

VENEZUELA

LINEA AEROPOSTAL VENEZOLANA.

Address.—Caracas. *Fleet.*—3 Latécoère 28-6 and 3 Lockheed Electras. *Routes served.*—Caracas-Maracaibo and Caracas-Santernando-Ciudad Bolivar, Caracas-Atures, Atures-San Fernando de Apure, and Atures-Puerto Paez.

AUSTRALASIA

AUSTRALIA

ADASTRA AIRWAYS PTY., LTD.

Address.—Derwent House, 136, Liverpool Street, Sydney. *Fleet.*—1 D.H. Dragonfly, 1 Waco YKS, and 1 B.A. Eagle. *Routes served.*—Sydney-Bega.

AIRCRAFTS PTY., LTD.

Address.—Eagle Street, Brisbane. *Fleet.*—D.H. Dragons. *Routes served.*—Brisbane-Cracow, Brisbane-Rockhampton-Cracow-Monto-Brisbane, Brisbane-Rockhampton-Monto-Brisbane, and Brisbane-Kingaroy.

AIRLINES (W.A.), LTD.

Address.—Nationl Bank Chambers, 54, St. George's Terrace, Perth, W.A. (operating from Maylands Aerodrome, Perth). *Fleet.*—1 D.H. Dragon and 1 Stinson Reliant. *Routes served.*—Perth-Wiluna-Kalgoorlie and Perth-Rottnest Island.

AIR TAXIS PTY., LTD.

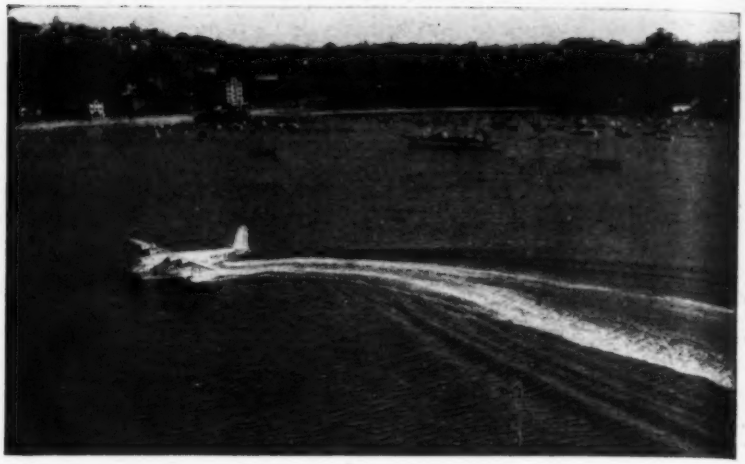
Address.—Connor Park Aerodrome, Rockhampton, Queensland. *Fleet.*—1 Monospar S.T.12 (Gipsy Majors) and 1 D.H. Leopard Moth. *Routes served.*—Rockhampton-Mt. Coolon, with extensive taxi and aerial ambulance services to Queensland.

AIRLINES OF AUSTRALIA, LTD.

Address.—14, Martin Place, Sydney. *Fleet.*—Douglas D.C.3, D.H. Dragons, Stinson Trimotors. *Routes served.*—Normanton-Burketown, Cairns-Normanton, Normanton-Koolatah, Cairns-Cooktown, Brisbane-Townsville, Townsville-Cairns, Brisbane-Lismore, Brisbane-Rockhampton, Sydney-Brisbane, and Cairns-Batavia.

ANSETT AIRWAYS, LTD.

Address.—The Aerodrome, Essendon, Victoria. *Fleet.*—Lockheed Electras, and Airspeed Envoys. *Routes served.*—Melbourne-Narrandera-Sydney, Melbourne-Sydney, Melbourne-Mildura-Broken Hill, and Sydney-Cootamundra-Narrandera, Melbourne-Hamilton, and Adelaide-Mildura-Narrandera.



The Qantas Empire Airways base at Rose Bay, Sydney, with one of the Qantas Empire boats—actually *Coolangatta*—being warmed up in the customary manner.

AUSTRALIAN NATIONAL AIRWAYS PTY., LTD.

Address.—The Aerodrome, Essendon, Victoria. *Fleet.*—Douglas D.C.2, Douglas D.C.3, D.H. Rapide, D.H.86, D.H. Dragons. *Routes served.*—Perth-Adelaide, Adelaide-Melbourne, Melbourne-Launceston-Hobart, Melbourne-King Is.-Launceston, Melbourne-Wagga-Canberra-Sydney, Melbourne-Mt. Gambier-Naracoorte-Adelaide, Melbourne-Sydney, Adelaide-Renmark-Broken Hill, Adelaide-Cowell-Port Lincoln-Adelaide, and Adelaide-Kangaroo Island.

BUTLER AIR TRANSPORT CO.

Address.—The Aerodrome, Mascot, New South Wales. *Fleet.*—2 D.H. Dragons. *Routes served.*—Sydney-Mendooran-Tooraweenah-Coonamble-Bourke-Cunnamulla-Charleville.

GUINEA AIRWAYS, LTD.

Address.—Currie Street, Adelaide. *Fleet.*—Lockheed Electras and Lockheed 14-H. *Routes served.*—Adelaide-Darwin.

MACROBERTSON-MILLER AVIATION CO., LTD.

Address.—156, St. George's Terrace, Perth, Western Australia (operating from Maylands Aerodrome, Perth). *Fleet.*—2 Lockheed Electras, 1 D.H.86, 3 D.H. Dragons, 1 Cessna 34 and 2 D.H. Fox Moths; 1 or 2 more Electras will possibly be acquired. *Routes served.*—Perth-Darwin, Wyndham-Daly Waters, and Adelaide-Iron Knob; also operates Flying Doctor services from Wyndham and Port Hedland.

NORTH WESTERN AIRLINES, LTD.

Address.—Moree, N.S.W. *Fleet.*—1 D.H. Dragonfly. *Route served.*—Sydney-Moree.

QANTAS EMPIRE AIRWAYS, LTD.

Address.—Shell House, Carrington Street, Sydney, N.S.W. (operating flying boats from Rose Bay Base, Sydney). *Fleet.*—6 Short C-class Empire boats, 2 D.H.86, 3 D.H. Fox Moths and 1 D.H. Dragonfly. *Routes served.*—Sydney-Singapore, Brisbane-Charleville-Longreach-Cloncurry, and Cloncurry-Mt. Isa-Daly Waters.

VICTORIAN AND INTERSTATE AIRWAYS PTY., LTD.

Address.—The Aerodrome, Essendon, Victoria. *Fleet.*—Miles Merlin. *Routes served.*—Melbourne-Hay.

W. R. CARPENTER AND CO.

Address.—19-21, O'Connell Street, Sydney, N.S.W. *Fleet.*—3 D.H. 86B. *Routes served.*—Sydney-Rabaul (New Guinea).

NEW GUINEA

GUINEA AIRWAYS, LTD.

Address.—Salamaua. *Fleet.*—4 Junkers G.31, 1 Junkers F.13, 1 Junkers W.33, 1 Junkers W.34, 1 Ford Trimotor and 1 D.H. Fox Moth. *Routes served.*—Salamaua and Wau to Bulolo Goldfields.

HOLDENS' AIR TRANSPORT SERVICES, LTD.

Address.—Wau T.N.G. *Fleet.*—2 Ford Trimotors. *Routes served.*—General goldfields charter.

MANDATED AIRLINES, LTD.

Address.—Salamaua. *Fleet.*—1 Avro 642, 2 D.H. Fox Moths, 3 D.H. Dragons, 1 Fokker F.7 and 1 D.H.50-A. *Routes served.* Salamaua-Wau, Salamaua-Bulolo, Salamaua-Otibanda, Wau-Otibanda, and Salamaua-Wau-Port Moresby (Papua).

Mandated Airlines was formed two years ago by a merger of W. R. Carpenter and Pacific Aerial Transport.

STEPHENS AVIATION, LTD.

Address.—Wau, New Guinea. *Fleet.*—2 D.H.66 Hercules, 1 D.H.50 and 6 light aircraft. *Routes served.*—From the coast to all aerodromes of the Morobe district, Goldfields.

NEW ZEALAND

AIR TRAVEL (N.Z.), LTD.

Address.—P.O. Box 55, Hokitika (operating from Southside Aerodrome, Hokitika, South Island). *Fleet.*—3 D.H. Fox Moths and 2 D.H. Dragonflys. *Routes served.*—Greymouth-Inchbonnie-Hokitika-Franz Josef, and Fox Glaciers-Bruce Bay-Haast-Okuru-Jackson's Bay.

COOK STRAIT AIRWAYS, LTD.

Address.—Wellington. *Fleet.*—4 D.H. Rapides. *Routes served.*—Wellington-Blenheim-Nelson, and Nelson-Greymouth.

TASMAN EMPIRE AIRWAYS, LTD.

Address.—Shell House, Carrington Street, Sydney, N.S.W. *Fleet.*—Modified C-class Short boats on order. *Routes served.*—Projected service Sydney-Auckland-Wellington-Sydney.

Formed in 1938 by Imperial Airways, Qantas Empire Airways and Union Airways of New Zealand.

UNION AIRWAYS (NEW ZEALAND), LTD.

Address.—Union Chambers, 36, Customhouse Quay, Wellington C.1 (operating from Milson Aerodrome, Palmerston North). *Fleet.*—3 D.H.86, 2 D.H. Dragons and 4 Lockheed Electras. *Routes served.*—Auckland-New Plymouth-Palmerston North-Wellington, Wellington-Christchurch-Dunedin, Auckland-Gisborne, Gisborne-Napier-Palmerston North, and Palmerston North-Blenheim-Christchurch; new service Palmerston North-Wanganui-Hawera should by now have been started.

COMMERCIAL AVIATION

THE WEEK AT CROYDON

"A. Viator's" Air Transport Commentary : Notices to Hostesses, International Effects and a Scoop Which Wasn't

FIRST news of the German fleet passing down the Channel seems to have reached England via Croydon, when Commander Moll, of K.L.M., landed here and reported that he had been able to give his passengers a sight of the warships. Quite a number of those passengers were on their way home from India, officers on leave, civil servants, and so forth, who had come through by the K.L.M. Eastern service from Calcutta, Karachi and other places. One vessel was said to bear a large "On tow" notice and to be attached to a sister ship with a piece of string.

In the buffet here the other evening, they tell me, a very well-known film star was busy with a glass of something comforting. The girl behind the counter asked for her autograph and the star remarked that she was too tired to write her name.

Certain instructions have been issued to K.L.M. air hostesses regarding a high standard of dress and personal appearance when in uniform. This seems to have created some excitement in the bosoms of newspaper reporters. One of these rushed to Croydon and said: "Show me one of these untidy air hostesses." Nothing of the kind was the case. The British Army is, for example, by no means untidy, nevertheless instructions regarding uniform and behaviour are issued from time to time. Similar instructions are issued every now and again to pilots and personnel of all air companies, but, for the most part, the newspapers do not get hold of the fact, and it certainly does not mean that these pilots and people were slovenly just before the issue of the order.

Mr. Maisky, Soviet Ambassador in London, went out by Scandinavian Air Express, K.L.M./A.B.A., early in the week, *en route* for Helsingfors, via Stockholm.

Imperial Airways, in conjunction with British Airways, is maintaining a considerable number of air services, which include the eight a day each way on the Paris route. Six services each way daily on the same line are operated by Air France. I am told that all these services are doing pretty well and that if the world situation were not so extremely silly they would scarcely fill the public demand. Commercial flying is, I am convinced, held in leash at the moment by the international situation, and I believe there would be a tremendous boom in air travel if things eased up a bit.

I have just seen the Fiat G.18V., of Avio Linee Italiane, arrive with bravely fluttering house-flags, fasces and axe emblem on the tail, crew of three, plus steward and all that, but out of it stepped a single slightly overawed passenger, and from its various freight compartments came some three to five small parcels. I admit that it is a newly reopened service, but Venice should be attracting tourists. Actually it is only to and from the peacefully inclined countries that you see, at the moment, big loads of passengers and freight.

A pathetic sidelight on the situation is the transport of gold which, nevertheless, brings grist to the air transport mill. One day last week K.L.M. brought in a million pounds' worth of filthy lucre, which was for transhipment to the U.S.A.

One of the companies recently collected from a railway station a consignment of eggs on which was a label addressed to the railway folk reading: "Dear Mr. Porter, this package contains valuable eggs. They won't bend, so be a sport and handle them carefully." No such message was thought necessary to the air company, though the eggs were going many times as far by air as they had gone by rail.

The other night a young journalist coming up Purley Way saw the scoop of a lifetime. Brilliantly illuminated by the airport searchlights was the alarming spectacle of the tail of a small machine sticking out of the ground, the tail being almost vertical. He hurried round the corner and arrived at the spot only to find everything normal and a row of small craft all in that position nearest to a horizontal which aircraft ever assume. There was no hole even, where the machine had dived into the earth. The answer was that a machine had got tipped on its nose whilst being man-handled and a contour of ground had produced the rest of the illusion.

H.R.H. the Duke of Kent with the Duchess of Kent made a trip by Imperial Airways, Frobisher class, to Paris and back last week. There is, of course, no reason why important people should not travel by air, but, on the contrary, every reason why they should, and I was, therefore, very surprised to hear some time back that very big noises in Germany have decided, or so it is said, not to travel by air.

Mail Delays

DURING the past few months a number of justifiable grumbles have been heard both here and abroad about the way in which the air mail on the Empire routes is so often delayed. The reason is not so much that services are actually late, but rather that a letter posted at a particular time does not necessarily find place on the next outward or inward service; everything depends on the actual loads being carried.

The Civil Aviation Section of the London Chamber of Commerce addressed a letter last Monday to the Secretary of State for Air on this subject, stressing particularly the congestion during the Christmas period. They suggest—as *Flight* has been doing for a number of years—that the only logical way of dealing with the problem is to provide special mail-carrying services. They mention the Vickers Wellington as a type which, if a number are available amidst the rush of the rearmament programme, might well be adapted and made available at short notice to undertake long-range, high-speed mail-carrying work. At the same time the Air Ministry is urged to proceed without delay in the development of a long-range prototype with a cruising speed of 250 m.p.h.; this order should, the Section feels, be placed by the Air Ministry itself to avoid delay.

K.L.M. at Manchester Again

DESPITE strong headwinds on April 17, the K.L.M. Douglas D.C.L., operating the first of the season's North Sea services, was only some twenty minutes behind time on reaching Manchester. The crew included: Cmdr. Schott, with Messrs. Malenaar (engineer) and Engleman (wireless operator), and Miss Keiser (hostess). The same crew will be on this route for at least three months, and it is understood that Douglas D.C.3s may later be used on this service. The freight on the first flight included several large boxes of bright spring flowers, presented by K.L.M. to hospitals in Manchester and Liverpool.

As the presence of foreign machines is still something of a novelty as yet at Manchester and to Northern people, a large number of visitors had arrived long before the machine appeared.

Incidentally, a brief and surprising announcement appeared in the same morning's papers that Doncaster airport was required for military units, and that passenger services would be diverted to another aerodrome. In any case, K.L.M. intends this year to treat Doncaster as an "on demand" landing point—particularly as North-Eastern Airways are now flying direct from Croydon to Newcastle.

COMMERCIAL AVIATION (CONTINUED)

Merger in East Africa

ONE of the Imperial Airways directors, Sir John Maffey, has recently visited Africa in connection with the proposed link-up of Wilson Airways and Rhodesia and Nyasaland Airways. While he was there Sir John said that it was possible that three D.H.95s, or Flamingos, might eventually be bought by the merger company.

Pacific Preparation

A FIFTY-YEAR agreement has now been reached between the United States and the British Governments for the joint occupation of the Pacific Islands of Canton and Enderbury, largely in connection with the trans-Pacific air services. During the period the islands will be administered by officials from each country, and it is clearly understood in the agreement that, so far as flying is concerned, their use shall be for civil purposes only.

Terminal at Southampton

AN up-to-date terminal building will shortly be put up at the New Docks, Southampton, for the use of Imperial Airways. The increase in traffic on the Empire routes has made the existing arrangements unsatisfactory, and the inauguration of the Atlantic mail services this summer will make the proposed terminal building essential.

As it will probably be two or three years before permanent buildings are erected at Netley, adjoining that stretch of Southampton Water which is being reserved exclusively for the use of flying boats, the terminal building at the New Docks (Berth 108) will be of a fairly substantial character. Passengers arriving by flying boat will be able to walk from the landing raft under a covered way into the Customs hall, adjoining which will be rooms for medical inspection and passport control.

There will be a private railway platform on the other side of the building and it is intended that, eventually, the "Flying Boat Special" will be able to run straight through from the terminal building at Southampton to Imperial Airways at Victoria.

The Jersey Accident

THE Air Ministry's accident department has just issued the report on the accident to the Jersey Airways D.H.86 at Jersey Airport on November 4. It may be remembered that all the thirteen occupants of the machine, as well as a man working on the ground, lost their lives.

At the time when the machine took off on the normal service the sky was completely overcast and the cloud-base height was between 120 and 150 ft. Immediately before the accident two other machines had left for England and these proceeded without mishap. A minute after the pilot had taken off from the airport and had reached a position about 500 yd. east of its original starting point, the machine was seen to emerge suddenly from the cloud at a height of about 120ft. in a steep left-hand side slip, and to dive to the ground with the engines apparently running under power.

The Air Ministry inspector is of the opinion that the accident was due to an "error of airmanship on the part of the pilot who, when making a climbing turn in a cloud, inadvertently allowed the machine to fall into a side-slip at a height which did not permit of recovery."

The Fastest Transport

THE latest French commercial machine to start its official tests at Villacoublay is the Potez 662, which was one of the few "real" commercial machines exhibited at last year's Paris Aero Show.

Air France are contemplating placing an order for a series of these machines. The 662's main feature is a top speed of 250 m.p.h., which makes it the fastest air liner produced to date. Its first flight was made on July 26 last year, since when it has been thoroughly tried out by the manufacturers the S.N.C.A. du Nord, Northern group of France's nationalised aircraft industry. This particular machine will not, however, be used on any of Air France's passenger routes, as it has been appropriated by the French Air Ministry for official use.

The Potez 661, its predecessor, only one of which was constructed, has now completed its 100 hours' flying-in time necessary before being handed over to Air Afrique for the trans-African service. The machine made its first trip over the route last week.

Another Imperial Subsidiary

ACCORDING to reports from Cairo, arrangements have recently been made between the Egyptian Government and the British Government, through Imperial Airways, for the creation of a new company to operate twice-weekly services between London and Cairo. This company will be known as Egyptian Air Lines, and, of the initial capital of £100,000, 51 per cent. will be held by the Egyptian Government. Apparently a subsidy will be offered both by the British and the Egyptian Governments.

American Export Ready

AS soon as their special long-range Consolidated flying-boat is ready American Export Air Lines will start survey flights between New York and Marseilles, via the Azores and Biscarosse. This machine will be in charge of a United States Navy pilot. In due course, this type of boat will be used by the company to carry freight and mails between America and Europe, but, ultimately, larger machines will be used for passenger work.

"ZZ" at Heston

SINCE the installation of flush-type contact lighting has now been completed at Heston, the "ZZ" radio approach facilities have been restored. The particular gonio hut has, however, been removed to a new site about 350ft. to the east of its original position. All D/F bearings on the 328 kcs. channel are now given from this position unless the bearing is preceded by the letter "A." At the moment only the outer marker beacon of the V.H.F. system is being switched on, as the inner beacon is out of action.

European Subsidies

THE details of a proposed agreement between the Air Ministry and British Airways for the new European services have just been published in the form of a White Paper (Cmd. 6005).

The agreement will be for the period between April 17 and October 7 this year, and will cover the company's services to Brussels with Lockheed Electras, and, with Lockheed 14s, to Berlin, Warsaw, Frankfurt and Budapest. The maximum subsidies for the period will be £19,500 for the Brussels service, £53,500 for the Warsaw service, and £53,000 for the Budapest service. As usual these sums will be reduced by the amount received for mail carriage; by half the amount by which the actual expenditure falls below the estimate on which the subsidy is based; and by half the amount by which the net revenue exceeds the corresponding estimate.

Whether or not the short period of the agreement and, in particular, the date of its termination (October 7), are connected in any way with the merger between British Airways and Imperial Airways remains to be seen. A really astute detective might suggest that October 7 is the date on which the merger arrangement will be completed—but he would probably be wrong.

Pilot-shortage in the Netherlands

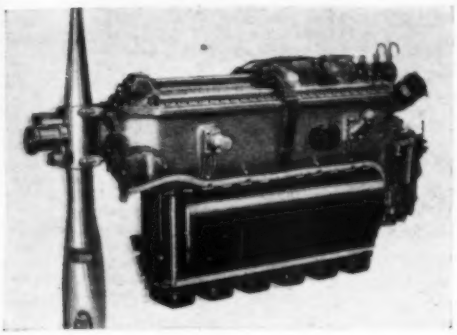
ACCORDING to a correspondent in Rotterdam, K.L.M. is at present suffering from a mild shortage of fully-trained transport pilots—largely because many of the younger ones have been retained with the Netherlands Air Force in connection with the special defence measures which have recently been taken. Some American pilots are already in the service of the company, and negotiations are in progress to engage Czechoslovakian pilots from C.L.S. They will have had ample experience of the Douglas D.C.2s and D.C.3s such as are used by K.L.M.

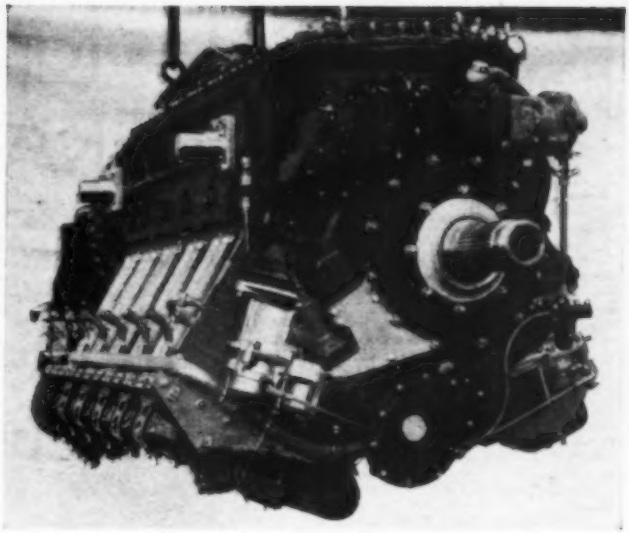
In the meantime, a K.L.M. official has gone to Iceland to study conditions there with the idea of starting a service from Copenhagen in co-operation with D.D.L. At the moment it is understood that Douglas D.C.4s may not, after all, be bought for the company's Far Eastern route and there is some talk of the purchase of Focke Wulf F.W.200 Condors.

A new airport has been planned in the east of Holland at Elst (Nijmegen) and the cost of laying it out will be shared by the Government and the local municipalities. There are rumours that the aerodrome at Twente may be closed, though this, with its D/F equipment, is of considerable value as an emergency landing ground when both Schiphol (Amsterdam) and Waalhaven (Rotterdam) are closed up by bad weather.

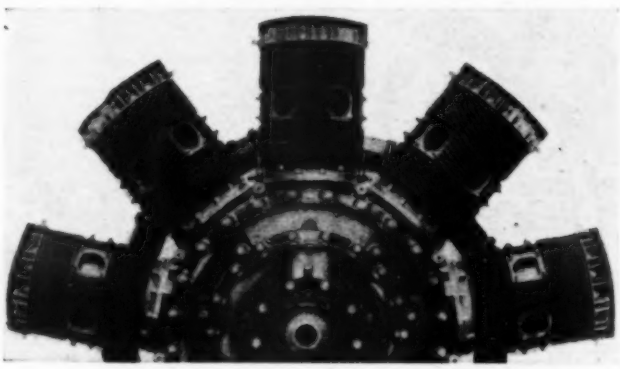
POWER FOR THE AIRLINES

Some Well-known British Engines in Current Use in Commercial Aircraft

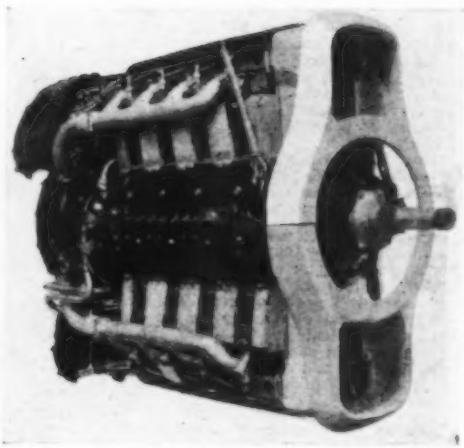




The 205 h.p. De Havilland Gipsy Six Series II, seen above (left) with the "1,000" size D.H. v.p. airscrew, is widely used on commercial types. Above (right) is the 410/425 h.p. Gipsy Twelve.

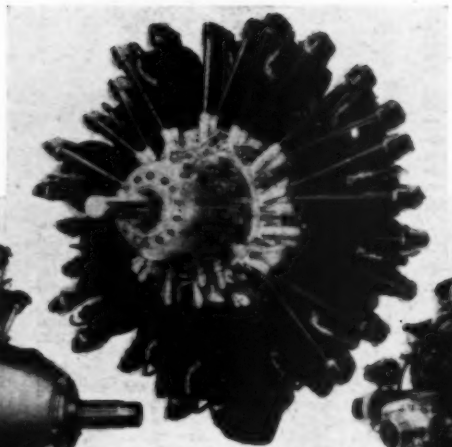


The sleeve-valve Bristol Perseus (above), in its civil-rated form (900 h.p. for take-off) is employed in the D.H. 95.

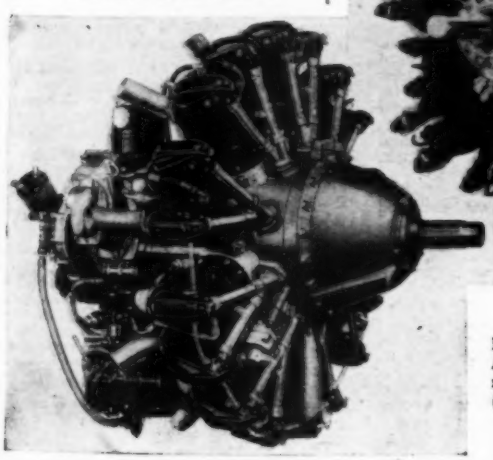


The sixteen cylinder Napier Rapier VI (above) gives 380/395 h.p. at 6,000ft. Four are fitted to the Short Mayo *Mercury*.

Although intended primarily for Service trainers, the Alvis Leonides (below) should have "commercial" applications. It gives 440 h.p. at 9,000 ft.



Compact power (137 h.p.) is offered by the little Pobjoy Niagara V (below)



Most powerful of the Armstrong - Siddeley range, the Tiger IX (above) gives 845/880 h.p. for take-off.

EQUIPMENT for the AIRLINE OPERATOR

Some Specialised Equipment Offered by the British Industry

This brief review is confined to aircraft equipment, mainly of the instrumental variety. Ground equipment was reviewed in our Airports Number (February 2).

AC-SPHINX SPARKING PLUG CO., LTD., DUNSTABLE, BEDS.—The introduction of the new AC zintered Zircrund insulator material has, it is claimed, made possible the development of a range of aircraft sparking plugs with heat characteristics hitherto unattainable.

Numerous types of sparking plugs have already been developed to meet the requirements of the most modern engines, amongst which might be mentioned M.K.1., a 14 mm. screened plug for air-cooled engines. The body is finned, while the insulator carries six rare metal fine-wire electrodes which spark on to a rare metal circular electrode fixed in the nose of the plug. Variations of this type of electrode construction are available to suit individual engine requirements.

The AC petrol gauge consists of a tank unit and a dash unit. The tank unit carries a rheostat in a case designed to be mounted on a flange in the tank. As the tank is filled with fuel the float rises, moving the brush on the rheostat and thus introducing resistance in the circuit. This earths the "full" coil in the dash unit, whereby part of the current flows through this coil and the pointer is attracted from the "empty" position, its point of rest depending on the fuel level.

This gauge construction has also been adapted as a flap indicator—in this case using merely two extreme gauge indications for "up" and "down" readings.

AIRCO LTD., 109, JERMYN STREET, LONDON, S.W.1.—Among the many accessories and items of aircraft equipment for which this firm are concessionaires may be mentioned B.G. sparking plugs, T.I. screening harness and the Detonindex, an engine detonation indicator. They are also sole agents for Auld metal-clad aircraft flooring, wing covering and sound proofing; and for the Protol process, an anti-corrosive protection for light alloys.

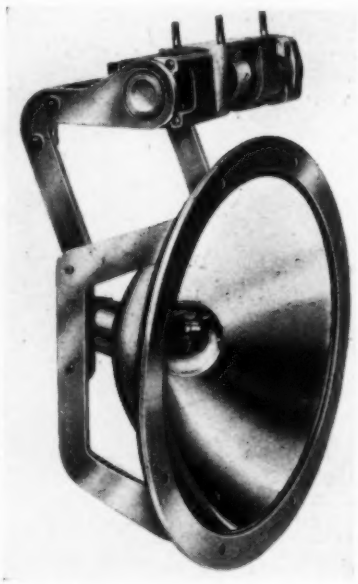
AVIMO, LTD., TAUNTON, SOMERSET.—This British concern is the exclusive licensee in this country for the manufacture of "Bronzavia" aeronautical equipment—the product of one of the leading French firms. Among the comprehensive range which they offer, the items having a more particular appeal to commercial airlines include two valuable safety devices—a highly efficient flame trap and an "anti-flutter" control damper; and two important aids to economical working—a sand trap, particularly useful in lengthening engine life when operating over desert areas or in the Colonies, and an airscrew brake, which effectively stops the rotation of a defective engine and prevents more extensive damage.

Avimo market in addition a high-pressure pipe coupling—a British invention—that combines errorproof efficiency with great rapidity and ease of connection. There is also an electrically heated pressure-head.

BARNET INSTRUMENTS, LTD., STAND FAST WORKS, BATH PLACE, BARNET, HERTFORDSHIRE, are designers and manufacturers of pressure, vacuum, and compound gauges for aeronautical and industrial purposes.

Flying instruments include suction gauges for vacuum-operated instruments, pressure gauges for oil, water, and air systems, boost gauges with multiple bourdon tubes arranged to be self-draining for condensed petrol (Grant's patents), and multiple-bourdon-tube absolute-atmospheric-pressure gauges. Parts of pressure gauges, such as bourdon tubes, instrument movements, pointers, etc., are supplied for incorporation in customers' own productions.

Experimental work in connection with pressure gauges or similar instruments can be carried out and special instruments created to customers' particular requirements. The firm is fully approved by the Air Ministry.



A Rotax electrically actuated retractable landing lamp as fitted to the D.H. Flamingo.

BENDIX, LTD., TYSELEY, BIRMINGHAM, produce a wide range of their well-known aircraft brakes in sizes from 3½in. to 24in. diameter and suitable for mechanical, pneumatic or hydraulic operation. The all-metal construction removes any danger of overheated tyres, and the combined wedge and servo shoe operation reduces fluid movement and air consumption to a minimum.

Ground steering has been specially studied. The Bendix differential control unit and thumb-operated control lever has a three-phase operation allowing free rudder movement in flight, progressive braking for landing and light brake applications for ground steering.

As adjuncts to their mechanically operated brakes, popular on the lighter types of aircraft, they supply mechanical differential units and telescopic brake controls which are light and easily mounted.

It is stated that over 70 per cent. of British-made aircraft operating on commercial airlines are fitted with Bendix brakes.

JAS. BERESFORD AND SON, LTD., CATO STREET WORKS, BIRMINGHAM.—Particularly important items of equipment in airline passenger accommodation, especially in these days of ever-lengthening route stages, are the specialised products of this firm—lightweight toilet equipment designed for aircraft use, such as wash-basins, W.C.s, etc.

BREEZE CORPORATION OF GREAT BRITAIN, LTD., 54, VICARAGE LANE, ILFORD.—This firm is responsible for a number of items of equipment used on commercial aircraft. Among these may be mentioned Breeze screening harness for ignition systems and the Breeze electrical distribution system, consisting of junction boxes and conduits, fitted with multiple plugs and sockets, the conduit helping to eliminate high-frequency interference. Other electrical equipment includes heat-resisting sparking plug elbows.

Then there is the Coffman cartridge engine starter, for single- or multiple-engined aircraft. This starter has a magazine breech for five cartridges and the system is claimed to guarantee positive starting at temperatures from minus 12 deg. C. The weight of the equipment is 33 lb. for engines up to 800 h.p. Hand turning gear weighs approximately 7 lb. per engine.

Another item is the Breeze tab control, chain- or cable-operated, and with cockpit indicating dial.

Pesco vacuum pumps for instrument and de-icer operation, and Pesco hydraulic pumps for a variety of purposes, are other items in the Breeze Company's range.

BRITISH THOMSON-HOUSTON CO., LTD., RUGBY.—Apart from magnetos, the reliability of which is well demonstrated by their performance in many notable flights, B.T.H. also make various types of electric starters for aero engines and compressors for use with air starters, air brakes, gas starters, etc.

Other B.T.H. products of interest to the commercial aircraft operator include Mazda lamps for aircraft lighting purposes.

HENRY BROWNE AND SON, LTD., STATION WORKS, BARKING, ESSEX, manufacturers of compasses for fifty years, are makers of the well-known "Sestrel" aeroplane compasses. The "Sestrel" P.4 has a justifiably high reputation, a special "Sestrel" micro-adjuster being a noteworthy feature. The compass is adjusted by a micrometer movement, giving great accuracy. A special locking device prevents any possible movement of the correcting magnets which may be caused through vibration. The "Sestrel" Mk. IIIA is also fitted with this highly sensitive corrector and locking device.

These compasses have played a vital part on numerous long-distance flights.

CAMBRIDGE INSTRUMENT CO., LTD., 13, GROSVENOR PLACE, LONDON, S.W.1.—Of particular value to the commercial aircraft operator is the Cambridge aero-mixture indicator, a flight instrument which analyses the exhaust gas from the engine and shows this analysis on a scale calibrated in air-fuel ratio over a range from 10 to 15. It provides the pilot with a continuous guide, enabling the mixture ratio to be controlled accurately at all altitudes.

Then there are the Cambridge temperature-measuring instruments: Vapour pressure thermometers for oil or air temperatures—inexpensive, robust, dial instruments; electrical resistance thermometers for air temperatures, enabling the temperatures at a number of points to be read on one dash-board indicator; and thermo-electric pyrometers for cylinder head temperatures.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., CLIFTON JUNCTION, NEAR MANCHESTER.—The "FZ" Exide aircraft batteries are designed for use in non-

aerobatic civil aircraft. They have a high capacity/weight ratio and may be tilted to an angle of 70 deg. from the vertical without spilling. "SFZ" and "BZF" ranges are suitable for aerobatic aircraft, both ranges being completely unspillable.

Another Exide speciality for commercial aircraft is a starting trolley, which, as ground equipment, was referred to in the Airports Number of *Flight* (February 2).

DENT AND CO. AND JOHNSON, LTD., LINWOOD, RENFREWSHIRE.—The firm has been engaged in the manufacture of the aircraft compass since the early days of flying. Products comprise all British Air Ministry types of compasses of up-to-date design. This firm also manufactures and supplies special alcohol-resisting paints for use in compass production.

ALEXANDER DUCKHAM AND CO., LTD., DUCKHAM HOUSE, 16 AND 18, CANNON STREET, LONDON, E.C.4, are manufacturers of Duckham's Aero N.P.5 (engine lubricating oil), which not only conforms to, but, it is claimed, actually surpasses, the Air Ministry's specification D.T.D.109.

They are also suppliers of all kinds of greases and special lubricants likely to be wanted in commercial aircraft maintenance.

DUNLOP RUBBER CO., LTD., FORT DUNLOP, BIRMINGHAM, manufacture a complete range of aircraft landing tyres and wheels, tail-wheel equipment and brakes (both pneumatic and hydraulic), together with equipment for the operation of subsidiary services.

The range of tyres and wheels is extremely comprehensive, and is suitable for aircraft ranging from the smallest single-seater to the largest passenger transport machine yet built. Brake equipment is also provided—either hand or foot operated hydraulic systems for aircraft of light and medium weight, and pneumatic or high-pressure oil-operated systems for larger types of aircraft.

GALLAY, LTD., VULCAN WORKS, EDGWARE ROAD, LONDON, N.W.2.—Although the majority of Gallay products (e.g., radiators, oil coolers, fuel tanks and sheet-metal parts) come under the heading of constructional components, one item concerned with radiation qualifies for a place in the present review. That is the Gallay cabin heater. The firm's patented systems, it is stated, have been developed under exceptional service conditions and the results obtained have given the utmost satisfaction.

GENERAL AIRCRAFT, LTD., THE LONDON AIR PARK, FELTHAM, MIDDLESEX, are supplying the Hermes Transreceiver, a well-proved lightweight transmitter and receiver for aircraft. It is supplied in two models, both with crystal-controlled master oscillator and comprising C.W. and M.C.W. telegraphy and radio-telephony.

Model "A" is for long wave only, incorporating five push-button frequencies, with a pretuned 600-metre emergency circuit available at a single throw of a switch. The apparatus is a compact unit measuring 22in. × 12in. × 9in. and weighing only 43 lb. complete with headphones and microphone.

Model "B" is an all-wave equipment, incorporating any six desired frequencies in the entire waveband (5-1,000 m.), accurately selected by means of dial switching. When the desired frequency is selected the correct crystal and coils are automatically brought into circuit, and communication can be commenced immediately. This model consists of one unit of exactly similar dimensions and weight to Model "A," with the addition of another unit measuring 12in. × 9in. × 7in. and weighing approximately 10 lb.

The Hermes equipment derives its power from a dynamotor driven by the ordinary 12-volt aircraft battery. The superhet receiver is the same in both models and covers a waverange of 5-1,000 metres. The receiver is claimed to be exceptionally selective and unsusceptible to interference. Accuracy of tuning is obtained by the use of a pitch control in conjunction with a two-speed tuning condenser.

Using the normal 200ft. trailing aerial, transmitting ranges obtainable on long waves under normal conditions are from 150-500 miles machine to ground on C.W., and from 150-300 miles machine to ground on M.C.W. and radio-telephony. On short waves the ranges are very much higher, but depend to a large extent on various factors which govern propagation of these waves. In actual practice, however, a range of over 3,000 miles has been obtained.

GENERAL ELECTRIC CO., LTD., KINGSWAY, LONDON, W.C.2.—Though primarily famed as suppliers of ground lighting equipment, G.E.C. also enter into aircraft lighting, notably as makers of "Osram" lamps for landing, navigation, cockpit and cabin lighting. Such equipment has been used on many notable flights right from the time when night flying was first taken up seriously.

Lamps for indicator signalling systems for aircraft control cabins are another G.E.C. speciality, and *Cambria* and *Caledonia* are so equipped.

The company also manufactures a wide range of electrical equipment, including wiring and cables for the aircraft industry.

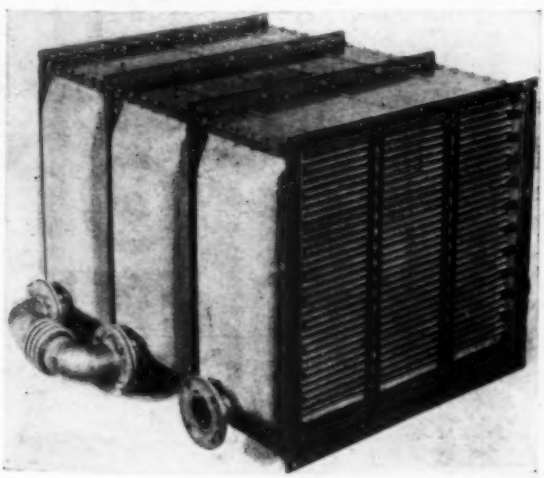
Neat tail drift sight developed by Salford Electrical Instruments Ltd.

GERM LUBRICANTS, LTD., CITY-GATE HOUSE, FINSBURY SQUARE, LONDON, E.C.2, market two standard oils for the lubrication of aero engines, and these are available at over fifty aerodromes in Britain as well as at many aerodromes abroad. "Germ Motoil XH," the summer grade, is in many instances used all the year round, and "Germ Motoil HS" is for winter use.

Both these oils are manufactured on the Wells-Southcombe process for increasing the vital property of "oiliness," and their comparatively flat viscosity curves have made them extremely popular.

INTAVA, LTD., 50, QUEEN ANNE'S GATE, LONDON, S.W.1, formed by the merging of the aviation interests of the Anglo-American Oil Co., Ltd., and the Vacuum Oil Co., Ltd., represents a world-wide distributing organisation for aviation fuels, oils, and greases. Intava fuels and oils are available at airports all over the world, and an international service can be given to airlines, commercial operators, or private owners, and by means of an Intava Carnet supplies of fuel and oil can be made on credit terms.

The products marketed include Aviation 100-octane fuel, 87-octane, 80-octane, etc., Intava Red Band and Green Band aviation engine oils, Intava utility oil for hydraulic mechanisms, and Intava greases for v.p. airscrews, rocker boxes, controls, etc.



(Above) A high capacity sectional air heater for cabin heating equipment, by Robertson Coolers, Ltd.

(Right) This view of the Hermes Transreceiver two-way aircraft radio equipment gives a good idea of its compact size. (General Aircraft Ltd.).

For the New York World's Fair—a display panel of Negretti and Zambra instruments.

IRVING AIRCHUTE OF GREAT BRITAIN, LTD., LETCHWORTH, HERTS.—For obvious reasons, the orthodox type of parachute is not widely used in commercial aircraft. The Irving Company, however, supplies a special chair-type parachute, which is incorporated in the upholstery of the seat, completely out of sight except for the shoulder straps.

This is becoming increasingly popular, as it is very easily put on in emergency and the adjustable lap strap makes it specially suitable for lady passengers. When the parachute is used in emergency the upholstery becomes a cushion to the harness during the descent.

J.V.W. CORPORATION, LTD., 16, BUCKINGHAM PALACE GARDENS, LONDON, S.W.1.—The Link Trainer (manufactured at Gananoque, Ontario, Canada, and supplied in this country by the J.V.W. Corporation) has now been adopted by all up-to-date countries. It provides a standard method of training in blind flying and blind landing. In Great Britain and the Dominions every unit in the Air Force is to be supplied with a Trainer and in the United States the civil aviation authorities encourage all transport pilots to spend 15 out of 20 obligatory blind-flying hours per annum in the Link Trainer. The United States aviation insurance authorities insist upon all transport pilots of aircraft insured by them doing a Link Trainer test every 60 days.

The running cost of the Trainer is 2½d. an hour and its maintenance costs are negligible.

K.L.G. SPARKING PLUGS, LTD., PUTNEY VALE, LONDON, S.W.15.—Nobody needs any introduction to K.L.G. Plugs, which, for aero use, are made in 12 mm., 14 mm., and 18 mm. thread diameters. They are offered in standard unscreened form with suitable connections for H.T. lead fittings employed on different engines, or in alternative models (denoted by the prefix letter R) to provide an integrally screened version. K.L.G. also manufacture complete screening equipment.

KELVIN, BOTTOMLEY AND BAIRD, LTD., BASINGSTOKE, HANTS.—The K.B.B.-Kollsman sensitive altimeter has been accepted by airlines throughout the world for its accuracy and reliability.

This is now followed by the production of a sensitive electric engine-speed indicator, having characteristics just as outstanding as those of the sensitive altimeter, which it resembles, in that it also has two pointers, giving three times the usual scale length, so that 10 r.p.m. is represented by a whole division on the scale. The indications of this instrument are dependent upon the frequency of the alternating current produced by a small generator coupled to the engine, and thus, it is stated, there are no commutators and no errors due to line resistance.

A synchroscope has also been developed for use with these engine-speed indicators in multi-engined machines, enabling the engines to be exactly synchronised.

Another recent development is the absolute barometric pressure indicator, calibrated in millibars, which enables controlled air traffic to keep spaced by flying at different pressure-levels, and thus eliminating the possibility of collision due to differences of altimeter barometric adjustment.

THE KORECT DEPTH GAUGE CO., LTD., PURLEY WAY, CROYDON, specialise in instruments of the metallic membrane type, such as air-speed indicators, self-contained rate-of-climb indicators, transmitting pressure gauges, etc. They also produce a continuous reading hydrostatic fuel contents gauge, type B.I.

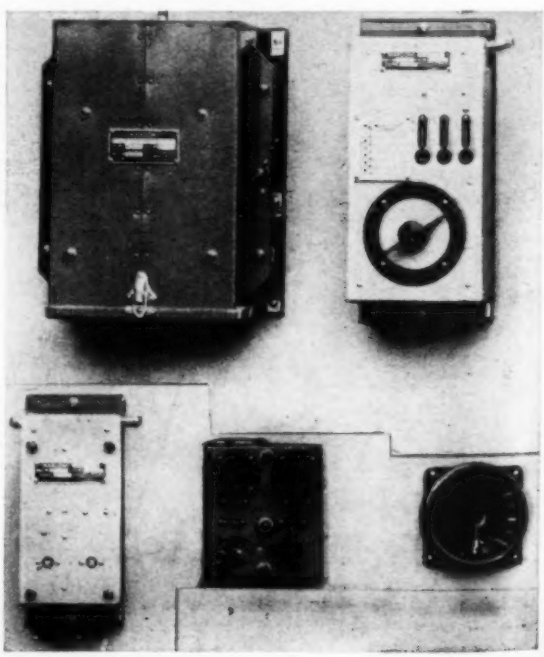
Associated with them is the Self-Priming Pump and Engineering Co., Ltd., who specialise in all types of aero engine pumps.

LODGE PLUGS, LTD., RUGBY.—The increasing use of ultra-short-wave radio in aircraft necessitates the complete screening of the ignition system, and it is necessary that the plugs shall be easy to remove from, and to replace in, the engine. Lodge plugs are so designed to make this possible.

The Lodge radio-screened plug, first to be made in England with the screen forming an integral part of the plug itself, is scientifically designed and is claimed to be completely opaque to electrical radiation. The materials used make the plug suitable for all aircraft, including seaplanes, the plug and cable fittings being rain- and spray-proof and resistant to the action of salt atmosphere. Alternative cable fittings can be supplied, e.g., for conduit-type, screening harness or for metal-braided cable.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., ELECTRA HOUSE, TEMPLE PLACE, LONDON, W.C.2.—Among the apparatus which has been developed by the Marconi Company to meet the ever-changing requirements of aviation are the "Marconitrack" ultra-short-wave beacon receiver, type AD66A, the "Marconitrack" ultra-short-wave approach beacon transmitter and the Marconi medium-wave aircraft direction finder type AD6072B.

The "Marconitrack" AD66A has been designed for operation in conjunction with any ultra-short-wave approach beacon which conforms with the international requirements regulating such beacons. Owing to the type of aerial system employed much reduced power is required to obtain the same range as in earlier systems. This reduces prime and maintenance costs. The "Marconitrack" aerodrome transmitter consists of a main beacon transmitter, two marker beacons of smaller power and control and monitoring equipment. The Marconi medium-wave D/F equipment, type AD6072B, has been designed for use on all types of civil, military or naval aircraft. Provision is made for reception on wavelengths from 150-2,000 metres, in three overlapping ranges, for CW, ICW and radio-telephony, and for direction finding when a frame aerial is employed. The fixed aerial, "homing," or rotatable frame aerial systems of direction finding can be used, and their respective accuracies are ±2 deg. for off-course variations, ±3 deg. for visual indication, and ±2 deg. within audible or visible ranges up to 150-200 miles.



"Marconitrack" AD66A ultra-short-wave approach equipment.

MECHANISM, LTD., GYRO WORKS, CROYDON, SURREY.—For some years past this firm has been steadily consolidating its position as manufacturers of aeronautical instruments. Its tricoloured navigation lamps are known the world over under the name of "Demec." Another of its products, in the shape of a pre-set landing light of very light construction, is likewise well known.

Also, for a number of years the design and construction of gyroscopic instruments has been concentrated upon, and an artificial horizon, together with various types of directional gyroscopes and pitch azimuth indicators, have been produced.

DAVID MOSELEY AND SONS, LTD., CHAPEL FIELD WORKS, ARDWICK, MANCHESTER, 12.—Special aircraft seat cushioning embodying the firm's famous "Float-on-Air" principle has been developed for airline work, and is fitted in the Empire flying boats. Roll and bounce in bumpy weather, it is claimed, are eliminated, as the seat is divided into four tubular portions, each communicating with the other by a slow-acting air valve.

The cushions are remarkably low in weight, the seats in the Empire boats weighing only 1 lb. 8 oz. and the backs 12 oz., making a total of 49 lb. 8 oz. for the twenty-two seats. These seats are convertible into mattresses for night-flying and also act as efficient lifebelts for emergency use.

Many other rubber accessories are also manufactured, including petrol hose, oxygen breathing tubing, mouthpieces, etc.

NATIONAL BENZOLE CO., LTD., WELLINGTON HOUSE, BUCKINGHAM GATE, LONDON, S.W.1.—The yellow wing-headed pumps of National Benzole Mixture are familiar on almost every British aerodrome. Particular advantages of benzole, it is claimed, are its quick response to the throttle and high volatility. The latter causes it to vaporise

immediately in the cylinders even at very low temperatures, thus ensuring easy starting.

The close connection which National Benzole has with coal, iron, steel and other staple industries of Great Britain greatly influences its popularity among flying people and motorists.

NEGRETTI AND ZAMBRA, 38, HOLBORN VIADUCT, LONDON, E.C.1.—This world-famous firm of scientific instrument makers is responsible for an extensive range of aircraft instruments, among them being some of special interest to the commercial operator, which are very fully described and illustrated in their catalogue "A/6."

Items include air temperature thermometers (mercury-in-steel and nitrogen-filled), boost gauges and diaphragms, fuel and oil pressure gauges, oil temperature, air-intake and radiator thermometers, precision altimeters, and the new cloud-base predictor.

NIFE BATTERIES, LTD., HUNT END WORKS, REDDITCH.—Success in the production of an ultra-low-resistance type of alkaline accumulator now enables an all-steel battery to be used for engine starting as well as for cabin lighting on aircraft.

In this connection it is interesting to note that the Empire flying boats are equipped with Nife steel-plate batteries for starting purposes, as well as for the usual lighting and wireless duties. These batteries consist of eighteen Nife cells, type AMS5, made to the requirements of the Air Ministry and Imperial Airways, and are used in series for the 24-volt wireless, cabin lighting and landing light circuits. A tapping is taken off the same battery to each of the four 12-volt electric starters for the Bristol Pegasus engines.

Nine types of Nife aircraft battery are listed.

OLDHAM AND SONS, LTD., DENTON, MANCHESTER.—Built throughout to meet all requirements of Air Ministry specifications, Oldham aircraft batteries are made in two 2-volt, one 6-volt and three 12-volt types.

Discharge curves published by the makers indicate unusually high efficiency under heavy duty.

P.B. DEVIATOR, LTD., 93, LANSDOWNE ROAD, CROYDON.—The P.B. automatic hydraulic control apparatus is, it is claimed, simple, reliable, and effective, and requires only the routine maintenance of oil replenishment and filter cleaning throughout a year's actual service. The total installation weight for three-axes control is under 60 lb.

The apparatus can relieve the human pilot of physical strain and add considerably to the passenger comfort and assurance of safety in rough-weather conditions. It can also relieve the pilot of navigation worries, for when linked up with radio D/F from any suitable ground station it constitutes a fully automatic pilot. This latter combination has proved particularly useful for aerial survey work where an accurate photographic mosaic is desired.

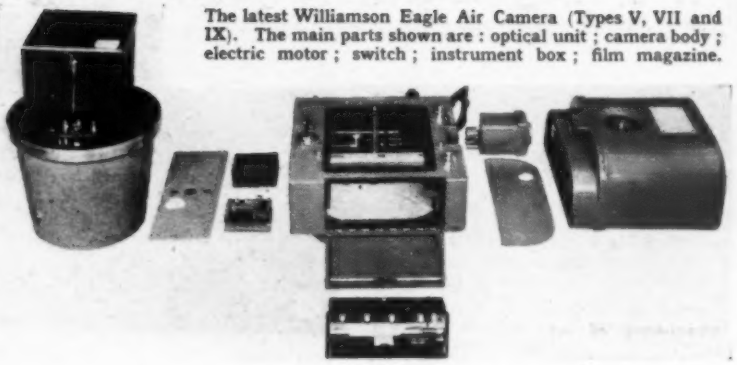
THE PALMER TYRE, LTD., THAMES HOUSE, MILLBANK, LONDON, S.W.1.—In addition to its full range of landing equipment the Palmer Company is now making a number of useful and interesting accessories, including non-slip rubber matting, rudder-bar toe-straps, inspection-hole covers, footrests, Silvoflex high-pressure hose, etc. The company is in a position either to develop designs suitable for standardisation or to meet individual requirements.

The comprehensive range of Palmer tyres, wheels and brakes is well known throughout the industry

The latest Palmer power hydraulic brake and gun controls have been fully approved by the Air Ministry.

PETO AND RADFORD, 50, GROSVENOR GARDENS, LONDON, S.W.1.—Both "aerobatic" and "non-aerobatic" aircraft batteries are manufactured by this firm, but only the latter category, of course, concerns the commercial operator.

It is stated that "Dagenite" accumulators are fitted almost exclusively as original equipment by British aircraft manufacturers, and the makers have been supplying the Air Ministry for over twenty years. There are many special features embodied.



The latest Williamson Eagle Air Camera (Types V, VII and IX). The main parts shown are: optical unit; camera body; electric motor; switch; instrument box; film magazine.

R. B. PULLIN AND CO., LTD., PHŒNIX WORKS, GREAT WEST ROAD, BRENTFORD, MIDDLESEX.—In designing the Pullin electrical turn indicator, it was the object of the manufacturers to produce an indicator which would be free from the disadvantages inherent in venturi-driven instruments (*e.g.*, ice formation, entry of moisture, foreign matter, etc.), but at the same time to provide one which, though electrically operated, could be placed in close proximity to the compass,

By means of a patented form of motor all troubles previously existing have been overcome. The instrument is compact, light and simple in operation. It is designed to be flush fitting and to occupy little space on the facia board.

R.F.D. CO., LTD., 17, STOKE ROAD, GUILDFORD, SURREY, are makers of all types of flotation gear for aircraft, including the pneumatic and box types; life-saving inflatable dinghies and rafts, automatic or manually operated; pneumatic motor dinghies; and flag and drogue targets; they also execute wire and rope splicing and experimental work.

RADIO TRANSMISSION EQUIPMENT, LTD., 45, NIGHTINGALE LANE, BALHAM, LONDON, S.W.12, have produced a transmitting and receiving apparatus which is capable of adaptation to many different conditions, although the separate units are standardised and, therefore, can be sold at a price within reach of the small airline operator. This equipment is particularly suitable for internal lines and charter companies.

The basic apparatus and its variants are designed for transmission of C.W., M.C.W. and telephony over a wave-range of 600 to 950 metres with seven spot waves in that band. The power output is 45 watts C.W. telegraphy and 12 watts telephony and M.C.W.

The receiver has a wave-range of 600 to 1,545 metres and has single-knob tuning control. The sensitivity is 4 to 6 microvolts for full output in headphones, which will ensure good reception under adverse conditions. The equipment can be used with fixed or trailing aerial. The total weight of the transmitter and receiver equipment does not exceed 26 lb., with an additional 2 lb. for the remote-control unit and 35 lb. for the rotary transformer when these are required.

RAGOSINE OIL CO., LTD., IBEX HOUSE, MINORIES, LONDON, E.C.3, one of the oldest lubricating oil manufacturers, have within recent years built up a complete service for the aviation industry. They supply oils and greases to all D.T.D. specifications.

The operator will be interested in penetrating oils, in "Rust Cut," rust preventives, and hydraulic brake fluid, and, of course, in "Minix" aero oils (approved by the Air Ministry and leading engine manufacturers).

REID AND SIGRIST, LTD., SHANNON CORNER, NEW MALDEN, SURREY.—Pioneers in the design and manufacture of the turn indicator as we know it at present; this firm has also developed a combined turn and lateral level indicator known as the Gyorizon. By the simple expedient of extending the turn needle, adding a pair of "wings" to it, and arranging for a visible liquid lateral horizon in the dial immediately behind, the firm has produced an instrument which, while providing all the essential indications in a fairly easily understood form, may also be used for flying in all possible attitudes, including the inverted position.

With either the standard turn indicator or the Gyorizon it is usual to fit a fore-and-aft level or pitch indicator, and that produced by R. and S. is one of the best-known examples.

ROBERTSON COOLERS, LTD., 211A, ACTON VALE, LONDON, W.3, are manufacturers of air heaters and storage tanks for cabin-heating systems. The use of a solderless type of mechanical joint for the heat transfer elements of the heaters is an attractive feature for applications where superheated steam is to be encountered. The materials used involve the minimum of weight, and the methods of construction allow the user to carry out all repairs in a simple and straightforward manner.

To exercise control on heating capacity and to reduce replacement costs, large units may be built up from interchangeable elements.

ROTAX, LTD., WILLESDEN JUNCTION, LONDON, N.W.10.—The items of greatest interest to the commercial aircraft operator in the latest Rotax range are (apart from magnetos, which hardly come within the scope of the present review) generators, starters and landing lamps.

The new D.H.95 (Flamingo) is extensively equipped with Rotax accessories, including a recently developed electrically retractable landing lamp and, in common with the majority of present-day aircraft, Rotax starters are fitted.

Of particular interest is the airscrew de-icer equipment which is now available, comprising a small gear pump and rheostat for transferring ethylene glycol from its storage tank to the propeller slinger ring, whence it is distributed by centrifugal force along the blades. Rotax are also in a position to supply pumps, electrically driven distributing valves, oil separators, etc., for the operation of mechanical wing de-icers.

Rotax fully screened engine-driven 1,000-watt generators and regulators, as used on both the Empire boats and A.W. Ensigns, are available, together with a range of smaller 500-watt and 150-watt generators.

Amongst the many other items in the comprehensive Rotax range of electrical equipment are vacuum pumps for operating blind-flying instruments; navigation lamps, batteries, switchboards, switches, under-carriage and flap motors, also radio generators, fuse boxes, dash and cabin lamps, etc.

L. A. RUMBOLD AND CO., LTD., KINGSGATE PLACE, KILBURN, LONDON, N.W.6, are pioneers and specialists in aircraft interior fittings, lightweight chairs, beds, tables, cabinets, parcel racks, ashtrays, etc. Complete cabin furnishing and upholstering are carried out and, it is stated, Rumbolds have contracts to carry out this specialised production on practically all the makes of civil aircraft in Great Britain. Cabin silencing is another big feature of the business.

SALFORD ELECTRICAL INSTRUMENTS, LTD., SALFORD, LANCS.—Apart from the electrical measuring and testing instruments for which it is famed, this com-

pany manufactures aircraft instruments, including altimeters, engine-speed indicators, and tail drift sights, one of which is illustrated in these pages.

SERCK RADIATORS, LTD., WARWICK ROAD, BIRMINGHAM, 11.—This firm has an enviable reputation as makers of aero-engine cooling equipment, and its experience has also been brought to bear in the allied field of aircraft cabin heating. Some interesting new developments in this sphere may shortly be expected.

SHELL-MEX AND B.P., LTD., SHELL-MEX HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2, offer, in addition to their well-known brands of lubricating oils, fluids and greases suitable for all aeronautical requirements. AeroShell Fluid 1 is a light, highly refined oil conforming to Air Ministry specification D.T.D.44B for non-freezing oils, and is suitable for use as a shock-absorbing element in hydraulic landing gear and for all hydraulic systems. AeroShell Fluid 2 is an oil suitable for coating the metal parts of airframes and engines which are exposed to corrosion. AeroShell Fluid 3 is a pure mineral oil which is suggested for flap reduction gear.

AeroShell Grease 1, intended for use in overhead-valve gear, and recommended for American radial engines, is not affected by water, and its consistency increases at high temperatures. A stiffer grease is provided in AeroShell Grease 2, particularly suitable for parts exposed to a high-velocity airstream. AeroShell Grease 3 has been approved for use in all D.H. v.p. airscrews, whilst AeroShell Grease 4 can be used for external controls, and meets the requirements of the Air Ministry specification for an anti-freezing grease. AeroShell Grease 5 is suitable for landing-wheel bearings, and AeroShell Grease 6 is a graphite grease for use if such is recommended.

SHORT AND MASON, LTD., MACDONALD ROAD, LONDON, E.17, are now producing, amongst their many instruments, a chainless-type boost gauge of small diameter, the dial measurement being 2½in. It is actuated from a specially heat-treated diaphragm and chainless movement of new and simplified design. Their air-speed indicator is also furnished with this specially heat-treated diaphragm. Their well-known altimeters, too, are now of the chainless movement variety and the introduction of the special diaphragm, it is stated, reduces lag to the minimum.

Among other instruments, Short and Mason are producers of aero compasses, rate-of-climb indicators, oxygen regulators, undercarriage indicators, etc.

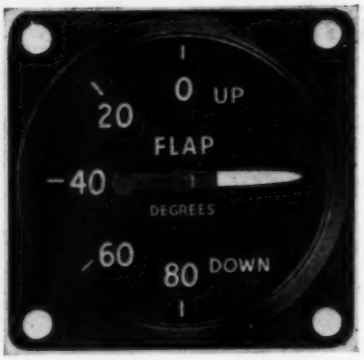
SIMMONDS AEROCESSORIES, LTD., GREAT WEST ROAD, BRENTFORD, MIDDLESEX.—Among the many products of this firm of interest to the commercial operator may be mentioned Simmonds-Corsey push-pull control, Simmonds-Goudime navigation instruments, and Simmonds electric and hydraulic contents gauges and flap and undercarriage indicator.

SILVERTOWN LUBRICANTS, LTD., MINOCO WHARF, WEST SILVERTOWN, LONDON, E.16, are manufacturers of Speedolene aero oil and Silvertown P.4 aero engine oil, both of which meet Air Ministry specification D.T.D.109. The former is claimed to exceed the specification by a wider margin than any similar lubricant, and is approved by all British aero engine builders, while several thousand tons of Silvertown P.4 have been used by the Air Ministry during the past few years, and the same grade represents a large share of the current contract.

Silvertown are also manufacturers of "Silarctic" oil to specification D.T.D.44B, which is recommended by the Bristol Aeroplane Co. for hydraulic controls, and "Silarctic" grease to Air Ministry specification D.T.D.143B, which is recommended by M.R.C., Ltd.

Speedolene aero oil is on sale at all principal aerodromes in this country.

SMITH'S AIRCRAFT INSTRUMENTS, CRICKLEWOOD WORKS, LONDON, N.W.2.—Amongst the most recent developments now included in the extensive range of instruments marketed by Smith's Aircraft Instruments is the Smith remote-reading equipment ("Desynn" system), which has been developed to meet the necessity for recording on the instrument panel the movements of control surfaces, and items of equipment such as petrol-float mechanisms, cowling gills and undercarriages. The instrument is electrically operated and is available for 12- or 24-volt circuits. The indicator incorporates an ingenious device to indicate supply failure.



The Smith remote-reading equipment ("Desynn" system), to record on the instrument panel the movements of control surfaces, undercarriages, etc.

In view of the increasing congestion of instrument panels, attention is being drawn to the use of warning lamps which operate in conjunction with warning units to which fuel and oil pressure can be applied. Such units are in production and available.

Another instrument arousing interest is the Mk.IIIB time-of-flight clock, which can also serve as a stop-watch. Unlike other clocks, this model reads up to 24 hours, and the dial is also calibrated in minutes and fifths of a second.

The Smith undercarriage position indicator is worthy of special note, since, it is stated, its reputation is now firmly established, and the demand increases constantly.

A point of particular interest to commercial operators is that the whole range of Smith's instruments is available in international cases. Full information on new instruments is given in the new loose-leaf catalogue produced by Smith's Aircraft Instruments, which is now ready for issue.

THE SPERRY GYROSCOPE CO., LTD., GREAT WEST ROAD, BRENTFORD, MIDDLESEX, specialises in blind-flying equipment, outstanding among which are the following:—

The Gyropilot, standard equipment on the Empire flying boats and also on the Ensign and Albatross, is stated to be the most widely used automatic pilot in the world. It will fly an aircraft with very great accuracy for long periods.

Gyro Horizon, giving a constant picture to the pilot of the attitude of his aircraft with relation to the real horizon.

Directional Gyro, which gives an absolutely dead-beat indication of course, and is quite unaffected by normal turns, so that changes of course may be made with great accuracy.

Anti-Vibration Panel, which provides an excellent mounting for the Sperry gyro horizon and directional gyro, and ensures that any vibration which may be transmitted to the instruments is so small as to be negligible.

Venturis for producing an instrument drive vacuum.

Vacuum Relief Valves, which may be fitted in the vacuum system close to the instruments and set to ensure that the ideal vacuum is maintained under all operating conditions.

Sperrys also offer a free maintenance instruction course to users of their instruments.

STANDARD TELEPHONES AND CABLES, LTD., NEW SOUTHGATE, LONDON, specialise in radio installations for aircraft and ground services in temperate or tropical climates. For civil use their products include high- and low-powered equipments for light aeroplanes and airliners; direction finders, radio compasses, and "Standard" blind-approach receiving equipments; ground stations with "spot" or "variable" wavelength selection and telephone/telegraph service; radio beacons; "Standard" blind-approach aerodrome installations; "Standard-Adcock" direction finders; and remote-control systems.

TECHNICAL IMPROVEMENTS, LTD., WANSEY WORKS, WANSEY STREET, LONDON, S.E.17, manufacture an approved system of ignition screening harness for aero and other engines, characterised by the reduction of weight to a minimum and the maintenance of maximum radio efficiency. Other manufactures include flexible couplings for high- and low-temperature oil lines and pipe clips.

C. C. WAKEFIELD AND CO., LTD., WAKEFIELD HOUSE, LONDON, E.C.2, are an all-British firm of specialists in lubrication. Their well-known Patent Castrol aero engine oils are obtainable in all civilised countries.

In March, 1935, the firm announced Patent Castrol, of which the exclusive feature is the presence of oil soluble compounds of chromium, $Cr(C_{17}H_{35}COO)_3$, and tin, $Sn(C_{17}H_{35}COO)_2$. The chromium inhibitor protects the cylinder walls against chemical corrosion by the products of combustion, and the tin compounds retard the oxidation of the oil in use, which would otherwise cause sludge formation.

To-day Patent Castrolaero, or Castrolaero C, is recommended or approved by all the leading aero engine makers and many famous aircraft constructors.

THE WESTON ELECTRICAL INSTRUMENT CO., LTD., CAMBRIDGE ROAD, ENFIELD, MIDDLESEX, supply a range of thermometers for use on aircraft. These are of the electrical type and have the considerable advantage that they require only a flexible wire connection between the instrument and the point at which the temperature is to be measured.

These thermometers are of two varieties, namely, (a) thermocouple-type for use on engine cylinders, and (b) a resistance bulb type for measuring lower temperatures.

In addition, there is available an electrical tachometer for the measurement of engine speed.

WILLIAMSON MFG. CO., LTD., LITCHFIELD GARDENS, WILLESDEN GREEN, LONDON, N.W.10.—One quite important aspect of commercial aviation is that of aerial photography. This can, in general, be divided into two sections, namely, vertical survey work and commercial oblique photography. The Williamson Mfg. Co. produce cameras to cover the needs of both these types of photography.

For vertical survey work the Williamson Eagle III and IV cameras have been augmented by an entirely new series called the Eagles V, VII and IX. These retain the louvre shutter, but have many interesting new features, the most important of these being the isolation of the optical system from the camera mechanism. This permits of any adjustment to the gears without disturbing the optical constants. The picture sizes of this new series are 5in. × 5in., 7in. × 7in., and 9in. × 9in., plus full instrument recording.

For commercial oblique photography Williamson have produced a new and improved design known as the P.15 hand camera. This camera takes either plates or films, and with the latter a special film magazine is supplied incorporating a pressure plate together with a chest-operated winder.

THE Y. S. C., LTD., 13, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.1.—The brilliant yet diffused light of the Holt wing-tip flare is still unequalled for giving the pilot an all-round view in case of emergency at night. The new type H.10 is extensively fitted to training machines, as well as being used in civil aviation.

An enormous improvement is made by the new approved type of Holt flare to specification No. 22/M, which gives approximately 30,000 c.p.

They are also large makers of "Very" signals and rockets and a wide range of pyrotechnics for aviation; all are packed for long storage and made with the same care as are the Holt flares.